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QUIZ-COMPENDS

PHARMACY

STEWART

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Handbook of

Embracing the Theory and Practice of Pharmacy and the Art of Dispensing.

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PHARMACY.

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LECTURER AND DEMONSTRATOR OF MATERIA MEDICA AND PHARMACY,
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AND THE
UNITED STATES PHARMACOPŒIA, EIGHTH REVISION (1905).

Sixth Edition, Revised and Enlarged

*WITH A VERY COMPLETE INDEX, AND TABLE FOR CONVERTING
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PHILADELPHIA:
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1906.

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PREFACE TO THE SIXTH EDITION.

The first edition of this Compend was issued in 1886 as a companion to Remington's Practice of Pharmacy with the consent of the author of that valuable treatise. Being primarily intended for the use of pharmaceutical students attending lectures in colleges of pharmacy the scope of the Compend is limited to the products and preparations of the United States Pharmacopœia, and is therefore restricted; while Remington's work covers the entire field of pharmacy in a very comprehensive and instructive manner.

The object of the author of this Compend is to present information concerning official products and preparations in such clear, concise, and condensed form as to be of special service to the student in memorizing it. The immediate end which the student has in view is to pass the examination before him in a creditable manner. His time is fully occupied by lectures and quizzes, and ofttimes by work in a drugstore in addition. He has therefore no time to read text-books. What he wants, and what he needs, is just such a book as this Compend.

But it is not the purpose of the author to place in the hands of students, or drug-clerks desiring to pass examining boards, a book to serve for "cramming." The work will be found of great value for use in the regular educational course, just the same as a "quiz" will be, but it is not intended, neither is it adapted, for conducting students across lots. There is only one way to obtain a pharmaceutical education, and that is by careful, systematic study and practical experience.

Pharmacists will find this Compend of great service as a means of reviewing and polishing up their knowledge of the U. S. Pharmacopœia, and for reference in regard to doses, metric equivalents, specific gravities, and other useful information, but it will not serve as a substitute for Remington's Practice of Pharmacy. The more the latter is studied, the more useful the Compend will be for reviewing its contents in so far as they relate to the Pharmacopœia.

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COMPEND OF PHARMACY.

INTRODUCTORY.

THEORETICAL AND PRACTICAL PHARMACY.

Pharmacy.—The science which treats of medicinal substances, comprehending not only a knowledge of medicines and the arts of preparing and dispensing them, but also their identification, selection, preservation, combination, and analysis.

Two Great Classes.—*Theoretical* and *Practical* pharmacy.

Theoretical Pharmacy.—A knowledge of the substances used as medicines, animal, vegetable and mineral, also of the laws governing them. It includes a knowledge of—

Botany, the science of plants; *Mineralogy*, the science of inorganic substances; *Zoology*, the science which treats of animals; *Physics*, or *Natural Philosophy*, the science which explains the changes produced in bodies without changing their identity; *Chemistry*, the science which treats of those changes which affect the specific identity of the bodies.

Materia Medica, the medicinal materials or substances used as medicine; *Pharmacognosy*, the science of crude drugs; *Toxicology*, the science of poisons; *Microscopy*, the art of examining the minute structure of bodies by the aid of artificial lenses arranged for magnifying; *Bacteriology*, the science which treats of micro-organisms.

Practical Pharmacy.—That branch of pharmacy which treats of the operations, processes, and methods used in applying the principles of theoretical pharmacy.

PHARMACOPŒIAS AND DISPENSATORIES.

Pharmacopœia: An authoritative list of medicinal substances, with definitions, descriptions, or formulæ for their preparation.

The necessity for authoritative standards to define the character, establish the purity, and regulate the strength of medicines, is recognized by all civilized nations.

Countries having no national Pharmacopœia adopt the standard of other countries, or supply standard pharmaceutical works for the same purposes.

The Pharmacopœias of all nations, except that of the United States, are issued under the authority of the respective governments. The U. S. P. is accepted as authoritative by the general government, and by the governments of the several States.

The U. S. P. was originally devised, and is decennially revised, by a committee appointed from the professions of medicine and pharm
It should be a representative list of the drugs and preparations emp
in therapeutics.

NOMENCLATURE OF THE UNITED STATES PHARMACOPŒIA.

How the titles of the medicinal substances are indicated in the U. S. P. 1, by the official Latin title; 2, by the official English title; 3, by the Synonym; 4, by the Botanical Name (in the case of plants); 5, by the Symbolic Formulæ (in the case of chemicals).

Examples of each: Cannabis Indica (official name); Indian Cannabis (English name); Indian Hemp (Synonym). Zinci Iodidum (O. N.); Zinc Iodide (E. N.); ZnI_2, 316.70 (Symbolic Formula). Prunus Virginiana (O. N.); Wild Cherry (E. N.); Prunus serotina (Botanical name).

1. The official Latin title should be used in designating the drug when precision is required—labels, prescriptions, specimens, etc.

Why the Latin language is employed: Because it is a dead language and is not liable to change, as in the case of a living tongue.

2. The official English title should be employed: in ordinary conversation, in commercial transactions, and in all cases "where the use of the Latin official name could be justly criticized as an ostentatious display of erudition."

3. The synonym is usually antiquated and from an unscientific source, but on account of long usage in common language synonyms cannot be completely ignored.

4. The Botanical Name.—By this is meant the systematic name recognized by botanists for plants, which serves in pharmacopœial nomenclature as the basis of the official name.

Capsicum fastigiatum is the botanical name for the variety of Cayenne pepper designated by the U. S. P. Capsicum indicates the genus, fastigiatum the species to which the plant belongs.

When a capital letter should be employed in writing the specific name: 1. When the specific name is derived from a generic name, as *Rhamnus Frangula;* 2. When derived from the name of a person, as *Strychnos Ignatii;* 3. When indeclinable, as *Erythroxylon Coca.*

The name of the author follows the botanical name, as *Capsicum fastigiatum* Blume, then the natural order to which the plant belongs, in italics, the latter being enclosed in parentheses, as (Nat. Ord., *Solanaceæ*).

When the botanical name should be employed: Its use is absolutely necessary in establishing the identity of drugs.

5. The Symbolic Formula.—The symbolic formula is a combination of symbols representing the chemical structure of the articles to which they refer, with the utmost brevity and exactness.

NaI means the same as Sodii Iodidum and Iodide of Sodium, but it is shorter and much more definite. $Na_2SO_3 + 7H_2O$, means sulphite of sodium containing seven molecules of water of crystallization, and no other sulphite of sodium.

The Official Definition.—In order to have no question what is meant by the titles, it is necessary to state explicitly in language which can be readily understood what kind or variety of the substance should be used.

The Purity Rubric.—This was introduced into the U. S. P. (eighth revision) to fix the amount of permissible innocuous impurities.

The figures following the symbolic formulæ express the molecular weight (the sum of the weights of the atoms) of the chemical. For example, the molecular weight of $Na_2SO_3 + 7HO_2$ is 250.39. Na weighs 22.88; two atoms are employed, which equals 45.76. S weighs 31.83. O weighs 15.88; three atoms are employed, which equals 47.64. H weighs 1; two atoms are employed, which equals 2. O weighs 15.88, which added to 2 equals 17.88. H_2O is taken 7 times; 7 times 17.88 equals 125.16; 45.76 + 31.83 + 47.64 + 125.16 = 250.39, the molecular weight of sulphite of sodium.

This matter of atomic and molecular weights can be made clear to the student by the following illustration: A pays B 100 sovereigns, English money, in sovereigns and half sovereigns, giving him 50 of the former and 100 of the latter; how much will the 100 sovereigns of gold weigh?

1 sovereign weighs 124 grains × 50 = 6200 grains.
½ " " 62 " × 100 = 6200 "

Weight of 100 sovereigns in gold, 12400 grains.

In the same way the molecular weight of water (H_2O) is 17.88.

H, Hydrogen atom, weighs 1 × 2 = 2
O, Oxygen atom, " 15.88 × 1 = 15.88

Molecular weight of H_2O, 17.88

Official Description.—Immediately following the official definition, there will be noticed in the Pharmacopœia, in smaller types, what is termed the official description: It usually consists of: (A) In drugs—1, a concise statement of physical characteristics; 2, tests of identity; 3, description of adulterants. (B) In chemicals—1, statement of physical characteristics, as in case of drugs; 2, solubilities; 3, tests of identity and purity.

Assay Processes.—The assaying of drugs and preparations has become necessary in order to definitely fix their value as medicinal agents.

Doses.—The Pharmacopœial Convention instructed the Committee of Revision to state the average approximate (but within a minimum or maximum) dose for adults, the metric system to be used, and the approximate equivalent in ordinary weights or measures inserted in parentheses.

DISPENSATORIES.

Dispensatory: A Dispensatory is a Commentary on a Pharmacopœia.

Dispensatories aim to present information concerning important non-official drugs and those official in other Pharmacopœias, as well as those of the U. S. P.

Dispensatories in the U. S.: We have in this country The United States Dispensatory, National Dispensatory, and King's Dispensatory.

PART I.

PHYSICS AND PHARMACEUTICAL OPERATIONS.

METROLOGY, SPECIFIC GRAVITY, AND SPECIFIC VOLUME.

METROLOGY.

Weight.—Weight is the difference between the attraction of the earth and that of surrounding bodies for bodies on the surface of the earth.

Upon what the weight of a body depends: Upon its bulk and density. Density is the amount of matter in given bulks of bodies.

What is meant by weighing: Balancing a body of known gravitating force with one whose gravity is not known, for the purpose of estimating the gravitating force of the latter, which is called its weight.

Weights: Bodies of known gravitating force used for weighing.

Name given to the apparatus used for weighing: Scales and weights.

Standards used upon which to base the system of weights: The Grain and the Metre.

How the grain weight was derived: By act of Henry III of England, in 1226; "An English silver penny, called the sterling, round and without clipping, shall weigh *thirty-two grains of wheat*, well dried and gathered out of the middle of the ear."

Metre: One 40-millionth of the circumference of the earth at its poles.

Systems of weights used in Pharmacy based on the Grain: The Troy or Apothecaries' system and the Avoirdupois system.

Denominations of each: *Troy or Apothecaries' Weight:* 20 grains = 1 scruple; 3 scruples = 1 drachm; 8 drachms = 1 ounce; 12 ounces = 1 pound. *Avoirdupois Weight:* 437½ grains = 1 ounce; 16 ounces = 1 pound.

Symbols of each: *Troy:* grain, or grains, gr.; scruple, ℈; drachm, ʒ; ounce, ℥. *Avoirdupois:* ounce, oz.; pound, ℔.

How many grains the ounce of each system contains respectively, and the difference in grains between the Troy and Avoirdupois ounce: Avoirdupois ounce = 437½ gr.; Troy ounce = 480 gr. Troy ounce 42½ grains greater.

Difference in grains between the Avoirdupois and Troy pound: Avoirdupois pound, 7000 gr.; Troy pound, 5760. Avoirdupois pound, 1240 grains greater.

Measure: The bulk or extension of bodies.

Systems of Measure used in Pharmacy: Apothecaries' or Wine Measure, Imperial or British Measure, and the Metric System.

Denominations of each: *Apothecaries' Measure:* 60 minims = 1 fluidrachm; 8 fluidrachms = 1 fluidounce; 16 fluidounces = 1 pint; 8 pints = 1 gallon. *Imperial Measure:* 60 Imperial minims = 1 Imperial fluidrachm; 8 Imperial fluidrachms = 1 Imperial fluidounce; 20 Imperial fluidounces = 1 Imperial pint; 8 Imperial pints = 1 Imperial gallon.

NOTE.—The U. S. Fluidounce is equal to 480 U. S. minims, and to 500 Imperial minims. The Standard Imperial gallon is the volume of 70,000 grains, or 10 avoirdupois pounds of pure water at + 62° F., barometer at 30 inches. One Imperial minim of pure water at + 62° F., only weighs 0.911458 grain.

Symbols of each: *Apothecaries' Measure:* Minim, ♏; fluidrachm, f ʒ; fluidounce, f ℥; pint, O; gallon, Cong. *Imperial Measure:* Minim, min.; fluidrachm, fl. dr.; fluidounce, fl. oz.; pint, O; gallon, C.

Relations of Apothecaries' and Imperial Measures to Troy and Avoirdupois Weights: *Apothecaries' Measure:* The pint of distilled water at 15.6° C. (60° F.) weighs 7291.2 gr.; the fluidounce, 455.7 gr.; the gallon, 8.33 pounds avoirdupois; pint weighs 1.0416 av. pound; pound equals 0.9601 pints. At 25° C. (77° F.), the temperature adopted for taking sp. gr. and solubilities by the U. S. P. (8th Rev.), the pint weighs 7273.3 gr. and the fl. oz. 454.6 gr., or, more accurately, 454.581 gr. Thus we have Troy oz., 480 gr.; av. oz., 437.5 gr.; fl. oz., 454.6 gr. *Imperial Measure:* pint weighs 8750 gr.; fluidounce, 437.5 (which is the same as the avoirdupois ounce, and 18.2 gr. less than that of the U. S. fluidounce of water at the same temperature); gallon, 10 pounds avoirdupois.

Approximate Measures: A tumblerful, f ℥ viij (240 Cc.). A teacupful, f ℥ iv (120 Cc.). A wineglassful, f ℥ ij (60 Cc.). A tablespoonful, f ʒ iv (16 Cc.). A dessertspoonful, f ʒ ij (8 Cc.). A teaspoonful, f ʒ i (4 Cc.). The equivalent given above for the teaspoonful, dessertspoonful, and tablespoonful are authorized by the U. S. P. (8th Rev.).

Metric System: A system of weights and measures which originated with Prince de Talleyrand, Bishop of Autun, France, in 1790, now legally used by the majority of all civilized nations.

Metre: The unit of length of the Metric, French, or Decimal system, from which all other denominations are derived.

How obtained: It was obtained by a measurement of the quadrant of a meridian of the earth, and is about $\frac{1}{40000000}$ of the circumference of the earth at the poles.

What it is practically: Practically, it is the length of certain carefully preserved bars of metal from which copies have been taken.*

What its equivalent is in feet and inches: It is equal to about 3 ft. $3\frac{3}{8}$ in.

Unit of surface, and how derived: The unit of surface is the Are, which is the square of ten metres (the square of a dekametre) = a square whose side is 11 yards.

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* Accurate models or prototypes have been made of the principal units of linear measure, measures of capacity, and weights. These actual standards are usually legalized, are carefully preserved in the custody of governments, and serve as originals, of which copies are taken directly or indirectly for actual use.

Unit of capacity, and how derived: The *Litre*, which is a cube of a tenth of a metre (the cube of a decimetre) = 2.1134 pints.

Unit of weight and how obtained: The unit of weight is the *Gramme*, which is the weight of that quantity of distilled water, at its maximum density (4° C.), which fills the cube of the one-hundredth part of the metre (cube of a centimetre, or, in other words, cubic centimetre, Cc.) = 15.43235 grains, or about 15½ grains.

Denominations of the Metric System multiplied and divided: They are multiplied by the Greek words, "Deka," Ten; "Hecto," Hundred; "Kilo," Thousand; and divided by the Latin words, "Deci," one-tenth; "Centi," one-hundredth; "Milli," one-thousandth

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TABLE SHOWING HOW METRIC UNITS ARE MULTIPLIED AND DIVIDED.

Quantities.	*Length.*	*Surface.*	*Capacity.*	*Weight.*
1000	Kilo-metre.	. . . .	Kilo-litre.	Kilo-gramme.
100	Hecto-metre.	Hectare.	Hecto-litre.	Hecto-gramme.
10	Deka-metre.	. . . .	Deka-litre.	Deka-gramme.
1 (Units.)	METRE.	ARE	LITRE.	GRAMME.
.1	Deci-metre.	. . . .	Deci-litre.	Deci-gramme.
.01	Centi-metre.	Centare.	Centi-litre.	Centi-gramme.
.001	Milli-metre.	. . . .	Milli-litre.	Milli-gramme.

—*Attfield.*

Use of the Gramme and Cubic Centimetre (fluigramme) as units of weight and measure: In the practical working of a laboratory, the gramme and its divisions are used for weighing, and the cubic centimetre (Cc. or fluigramme) for measuring liquids. A gramme and a cubic centimetre of distilled water are identical, but owing to greater or less density, cubic centimetres of other liquids weigh more or less than a gramme. But if the Cc. is taken as a unit of capacity only, and the gramme as the unit of weight, all difficulty is avoided. For example, dissolve 1 gramme of sugar in sufficient quantity of water to make 10 Cc. It is evident that each Cc. of this solution contains 1 decigramme of sugar. By keeping the Cc. intact and varying the strength of the solution, each Cc. can be made to contain any stated amount of sugar from saturation to infinity.

TABLE OF EQUIVALENTS.

One Cubic Centimetre,..............	=	16.23	Minims.
Four " "	=	1.08	Fluidrachms.
Thirty " "	=	1.01	Fluidounces.
One Minim,......................	=	0.06	Cubic centimetres.
Four "	=	.25	"
Ten "	=	.62	"
One Troy drachm,..................	=	3.888	Grammes.
One Troy ounce,....................	=	31.103	"
One Avoirdupois ounce,..............	=	28.35	"

METRIC WEIGHTS AND MEASURES, AND EQUIVALENTS, USED IN THE DOSE SYSTEM OF THE U. S. PHARMACOPŒIA.

Mg. = Milligrammes. Gm. = Grammes. Cc. = Cubic centimetres.

.15 Mg. = $\frac{1}{400}$ gr.
.30 " = $\frac{1}{200}$ "
.40 " = $\frac{1}{160}$ "
.50 " = $\frac{1}{128}$ "

1 Mg. = $\frac{1}{64}$ gr.
2 " = $\frac{1}{30}$ "
3 " = $\frac{1}{20}$ "
4 " = $\frac{1}{16}$ "
5 " = $\frac{1}{10}$ "
8 " = $\frac{1}{8}$ "
10 " = $\frac{1}{5}$ "
15 " = $\frac{1}{4}$ "
30 " = $\frac{1}{2}$ "
45 " = $\frac{3}{4}$ "

65 Mg. = 1 gr.
125 " = 2 "
200 " = 3 "
250 " = 4 "
500 " = 7½ "

1 Gm. = 15 gr.
2 " = 30 "
3 " = 45 "
4 " = 60 "
8 " = 120 "
16 " = 240 "
30 " = 1 oz.

.008 Cc. = ⅛ minim.
.05 " = 1 "

.1 Cc. = 1½ minims.
.2 " = 3 "
.3 " = 5 "
.5 " = 8 "

1 Cc. = 15 minims.
2 " = 30 "

4 Cc. = 1 fl. dr.
8 " = 2 " "
16 " = 4 " "

30 Cc. = 1 fl. oz.
60 " = 2 " "
120 " = 4 " "
360 " = 12 " "

Explain the signification of the Micromillimetre and the Kilo: Micromillimetre (Mkm.) is a term used in microscopy, and signifies the one-thousandth part of a millimetre. Kilo is merely an abbreviation of the word kilogramme, and is used for convenience and brevity.

How to convert metric weights or measures into those in ordinary use: Multiply the metric quantities by the corresponding equivalent. Ex.: To convert—

Metres into inches, ...	multiply by	39.370
Litres into fluidounces, ...	" "	33.815
Cubic Centimetres into fluidounces, ...	" "	0.0338
" " " Imperial fluidounces, ...	" "	0.0352
Grammes into grains, ...	" "	15.432
Decigrammes into grains, ...	" "	1.5432
Centigrammes " "	" "	.15432
Milligrammes " "	" "	.015432

How to convert the weights and measures in ordinary use into metric weights and measures: Multiply the quantities by the corresponding metric equivalent. Ex.: To convert—

Inches into metres, ...	multiply by	0.0254
Fluidounces into cubic centimetres, ...	" "	29.572
Grains into grammes, ...	" "	0.0648
Avoirdupois ounces into grammes, ...	" "	28.3495
Troy " " "	" "	31.1035

See table of equivalent weights and measures employed by U. S. Coast and Geodetic Survey in back of this book.

Balance: An instrument for determining the relative weight of substances.

Balances: There are five kinds: 1. Single beam, equal arm. 2.

Single beam, unequal arm. 3. Double beam, unequal arm. 4. Compound lever balances. 5. Torsion balances.

Construction, requirements, and tests of each: 1. SINGLE BEAM, Equal Arm.—*Construction.*—A beam is suspended on a knife-edge, which divides it into equal arms; end knife-edges are placed at each end of the beam, on the same plane and at equal distances from the point of suspension, for supporting the pans which carry the substances to be weighed.

Requirements.—1. "When the beam is in a horizontal position, the center of gravity should be slightly below the point of support, or central knife-edge, and perpendicular to it." 2. "The end knife-edges must be exactly equal distances from the central knife-edge; they must all be in the same plane, and the edges absolutely parallel to each other." 3. "The beam should be inflexible, but as light in weight as possible, and the knife-edges in fine balances should bear upon the agate planes."

Test.—1. Sensibility with unloaded pans: 1. Place the balance in position on a perfectly level counter or table; elevate the beam so that it is free to oscillate; when the balance comes to rest, place the smallest weight to which it is sensitive upon the right-hand pan, to which the balance should immediately respond. 2. Sensibility with loaded pans: Place the full weight the balance is designed to carry on the pans, then on one pan place the smallest weight, as before. The balance should respond in a decided manner. 3. Equality of arms: Load the pans to half their capacity, perfecting the equilibrium, if necessary, with a piece of tin-foil. Now reverse the weights, and if the equilibrium is still maintained, the arms of the beam are equal. 4. Parallelism in knife-edges: Moderately load and balance the pans. Now shift one of the larger weights in different positions on the edge of the pan, carefully noting any variation in equilibrium, if such occur. This variation indicates a want of parallelism in the knife-edges.

2. SINGLE BEAM, Unequal Arm.—*Construction.*—This can be seen by inspecting the well-known Fairbanks scales. It depends on the principle in physics, "The *power is to the weight or resistance in the inverse ratio of the arms of the lever.*" The longer arm of the beam is graduated for a movable weight, the use of which dispenses with small weights, which is a decided advantage.

3. DOUBLE BEAM, Unequal Arm.—*Construction.*—Same as the above, but with two parallel beams. Employed for weighing liquids, etc., the outside beam being used to tare the bottle or jar.

4. COMPOUND LEVER BALANCES.—Well shown in the Fairbanks platform scales, used for druggists' counters and sometimes for prescription scales. Trömner has an excellent scale for weighing liquids on this principle.

5. TORSION BALANCES.—A compound beam is balanced and supported upon an immovable center frame, upon which a flattened gold wire is stretched with powerful tension; the beam is prevented from slipping out of place, and the torsion is secured, by the gold wire being firmly fastened to the under side of the beam; upon the ends of the beam are fastened the movable frames which support the pans. There is a simple method of arresting the motion by moving the lever, and

the delicacy of the balance is increased by placing a weight upon the index, whereby the center of gravity is elevated. *Knife-edges are done away with entirely.*

How Balances may be protected: By enclosing them in glass cases with convenient sliding doors.

How liquids are measured: In graduated vessels; vessels of tinned copper, tinned iron, and enameled sheet iron, called agate, are usually employed for quantities larger than one pint; but glass measures are preferable for quantities of one pint or less. The former are generally made larger at the bottom than at the top; the latter are either conical, with apex at the bottom, or cylindrical, and graduated on the sides. It is better that the marking be on both sides of the graduate.

How to test a glass graduate: Place it upon a perfectly level surface, then pour into it 455.7 grains distilled water at 15.6° C. (60° F.). This should measure one fluidounce; or, measure into the graduate 30 Cc. of water (29.57 Cc.) for a fluidounce.

Graduated Pipette: A glass tube graduated on the side, with a constricted point. It is used by applying suction to the upper end, and holding the liquid in the tube by placing the finger on the upper end while reading off the contents.

Meniscus: Owing to capillary attraction, the top of the liquid in a graduated pipette presents a cup shape. This is called a *meniscus.* A line drawn through the bottom of the *meniscus* is usually selected as the reading point.

Size of a drop: Erroneously, a drop is supposed to be a minim; but though this may be approximately true when applied to water, it is not true in regard to any other liquid. Thick, viscous liquids produce large drops; heavy, mobile liquids small ones. A drop of syrup of acacia is five times as large as a drop of chloroform. The shape and surface from which the drop is poured also influences its size.

SPECIFIC GRAVITY.

Specific Gravity: The comparative weight of bodies of equal bulk. It is ascertained by weighing the bodies with an equal bulk of pure water at a given temperature and atmospheric pressure, which is taken as one.

How to obtain the Specific Gravity of a body: To obtain the specific gravity of a body, it is only necessary to balance it with an equal bulk of the standard, and ascertain how many times the weight of the standard is contained in its weight. Ex.: A fluidounce of water (standard) weighs 455.7 grains; a fluidounce of lime-water weighs 456.3 grains; 456.3 ÷ 455.7 = 1.0015, that is, the lime-water weighs 1.0015 times more than water, bulk for bulk. In other words, its specific gravity is 1.0015. A fluidounce of alcohol weighs 422.8; 422.8 ÷ 445.7 = 0.928, specific gravity.

General rule for finding Specific Gravity: Divide the weight of the body by the weig [illegible] f water; the quotient will be the speci [illegible]

Meth [illegible] **of the equal** [illegible] A solid body immersed in water will displace its own bulk; it is required to find out the weight of this equal bulk of water. This might be ascertained by immersing the body in a vessel of water already full, then saving and weighing the displaced water which runs over. But there is a better way of finding out. Archimedes filled his bath-tub too full of water, one day, and it overflowed when he got into it. This led him to experiment, and he found that when weighed in water he lost as much weight as the water he displaced weighed. It is only necessary, then, to weigh a body first in air, then in water, and note its loss of weight when weighed in the latter medium. This loss is evidently the weight of an equal bulk of water. By our rule, we divide the weight of the body by the weight of an equal bulk of water; and it follows that it is the same thing to say: divide the weight of the body by its loss of weight in water, for that loss is the weight of an equal bulk of water. The quotient will be the specific gravity.

How to take the Specific Gravity of a body heavier than water: Four methods are used. *First method:* Accurately weigh the substance and note the weight. Now suspend the body from the hook at the end of the scale-beam with a horse-hair, so it shall hang a little above the scale-pan; next, place a small wooden bench in such a manner that it shall straddle the scale-pan, but not touch it; place a small beaker on the bench, partly filled with water, in which submerge the suspended body, noting the loss of weight by the use of proper weights on the opposite scale-pan; after which apply the rule already given. Ex.: Weight of a piece of copper in the air, 805.5 grains; weight in water, 715.5 grains; loss of weight, 90 grains. $805.5 \div 90 = 8.95$, sp. gr. *Second method:* With the specific gravity bottle. Add 1000 to the weight of the substance in the air. Now drop it into a 1000-grain specific gravity bottle, fill the bottle with water and weigh again. Subtract the 2d sum from the 1st sum, and the difference is the loss of weight in water. Now apply the rule. Ex.: A piece of aluminum wire weighs 100 grains in the air. $100 + 1000 = 1100$. Dropped in a 1000-grain specific gravity bottle, and the bottle filled with water, the weight of both is 1062. Then $1100 - 1062 = 38$ grains, the loss of weight in water. $100 \div 38 = 2.63$, specific gravity. *Third method:* With the graduated tube. Drop the substance into a tube graduated so that each space shall indicate a grain or gramme of water, and note how much higher the liquid rises in the tube, which is the weight of an equal bulk of the substance. This known, apply the rule. *Fourth method:* By immersing the solid in a transparent liquid of the same density. Drop the solid in a liquid of sufficient density to float it, then reduce its density with water until the solid neither rises nor sinks, but swims indifferently. The specific gravity of the liquid and solid will now be the same. Take out the solid and find the specific gravity of the liquid with the specific gravity bottle.

How to proceed if the solid were soluble in water: Use oil or some other liquid in which the solid is not soluble, as though it were water, then, by the following proportion, find the loss of weight in water; as the specific gravity of oil is to the specific gravity of water, so is the loss of weight in oil to the loss of weight in water. Then apply the rule.

How to take the Specific Gravity of a solid lighter than water: Force the substance under water by attaching a heavier body to it. First weigh both in the air, then both in water, and the difference will be the loss of both in water. A simple subtraction will give the loss of weight of one. Then apply the rule.

Apparatus for taking the Specific Gravity of a liquid: A specific gravity bottle, hydrometer, or specific gravity beads.

How to construct a Specific Gravity bottle: A bottle with a long, slim neck is counterpoised by an appropriate weight, and distilled water at the appropriate temperature, 15° C. (60° F.) poured in until it contains 1000 grains. The height reached by the water in the neck is then scratched thereon with a file, and it is ready for use.

Specific Gravity beads: Little pear-shaped, hollow globes of glass, loaded at the apex, and arranged to float indifferently in liquids of the specific gravity for which they are gauged, but to sink or swim in liquids that are lighter or heavier than they are.

Directions for using the Specific Gravity bottle for taking the Specific Gravity of Liquids: Counterpoise the bottle and fill it to the mark with the liquid to be examined. The number of grains the liquid weighs, properly pointed off decimally, is its specific gravity. A 1000-gr. specific gravity bottle will hold 1160 grains of hydrochloric acid. Point off decimally 1.160, which is the specific gravity of hydrochloric acid. A 1000-gr. specific gravity bottle will hold 750 grains of ether. Point off decimally 0.750, thus showing the relation to the specific gravity of water, 1.

When a bottle of any size is substituted for the 1000-gr. bottle, the following equation will give the specific gravity: As the number of grains of water the bottle holds is to 1000 (the specific gravity of water), so is the number of grains of liquid it holds, to the specific gravity of the liquid.

Hydrometer: As now constructed, the hydrometer usually "consists of a glass tube loaded at the bottom with mercury or small shot, having a bulb blown in it just above the loaded end." The principle of its action depends upon the fact that a solid body floating in a liquid displaces a volume of liquid exactly equal to its own weight.

Two general classes of Hydrometers: First, those for liquids heavier than water; second, those for liquids lighter than water. The first class are called by the French *Pèse-Acide*, or *Pèse-Sirop*, and the second class *Pèse-Esprit*.

Other class of Hydrometers in use: Those intended to sink, by the addition of weights, to a given mark on the stem, and thus displace a constant volume.

Baumé Hydrometer: The instrument devised by Baumé is peculiar only in so far as its system of graduation is concerned. This was made in the following manner: *First, for liquids heavier than water*, the instrument was loaded with sufficient mercury to sink it in water to a convenient point near the top, which was marked 0. It was then placed in a 15 per cent. salt solution, and the point at which it rested marked 15; the interspace between 0 and 15 was now marked off into 15 equal spaces, and the scale below extended by marking off similar spaces. *Second, for liquids lighter than water*, a 10 per cent. salt solution was used, and the instrument loaded to sink into it to a point just above the bulb, which was marked 0. It was then allowed to sink in water, and the point of rest marked 10. The interspace between 0 and 10 was now divided into 10 equal spaces, and the scale above extended by marking off equal spaces.

Objection to Baumé's Hydrometer: The graduations are entirely arbitrary, necessitating computation to determine the corresponding specific gravity.

Hydrometer which is rapidly taking its place: The Specific Gravity Hydrometer; the graduations upon the stem indicating at once the specific gravity.

Urinometer, *saccharometer*, elæometer (for fixed oils), and alcoholometer, are hydrometers for the special purposes indicated by their names.

SPECIFIC VOLUME.

Specific Volume: The volume of one body compared with the volume of an equal weight of another body selected as its standard, both bodies having the same temperature. Directly opposite specific gravity. Temperature chosen, usually 25° C. (77° F.).

Rule to obtain the Specific Volume of a Liquid: Divide the volume of the given weight of the liquid by the volume of an equal weight of water, or divide the sp. gr. of water (1.000) by the sp. gr. of the liquid. Ex.: 1403 Gm. of HNO_3 measure 1000 Cc. and 1403 Gm. of H_2O measure 1403 Cc.; then $1000 \div 1403 = 0.7127$, sp. vol. of HNO_3.

Rule to obtain the Volume of a Given Weight of a Liquid: Multiply the volume of an equal weight of water by the sp. vol. of the liquid. Ex.: How many fl. oz. are there in 100 oz. av. of HNO_3? 100 oz. av. of H_2O measure 96.21 fl. oz.; then $96.21 \times 0.7127 = 68.56+$ fl. oz. of HNO_3.

HEAT.

Heat: Heat is molecular motion.

Furnace: A species of stove for generating heat.

Elements of a Furnace: The *air-flue*, *combustion-chamber*, and *vent* or *chimney*.

Proportion which they should bear to each other: The special object sought in constructing the furnace must determine the proportions these shall bear to each other.

Best fuel for generating heat: Anthracite coal.

How much air is required to burn one pound of coal: Theoretically, 150 cubic feet; practically, twice that.

Liquids used for fuel in pharmacy, and on what their heating power depends: Alcohol, petroleum or coal oil, and benzin or gasolene. They all contain C and H (alcohol, 34 per cent. O in addition), on which their heating depends.*

Illuminating Gas: A mixture of carburetted hydrogen (CH_4), which is its principal constituent, with considerable hydrocarbons, hydrogen, carbon dioxide and monoxide, aqueous vapors, and traces of oxygen and nitrogen.

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* For special apparatus for developing heat for pharmaceutical manipulations, see Remington's "Practice of Pharmacy."

How it may be fitted for heating purposes: By mixing it with air. This is done by admitting air below the flame, using special apparatus for this purpose.

Bunsen Burner: A brass tube, four inches high, with four large circular holes near the base, to admit the air, which may be regulated by a perforated brass ring which surrounds the tube, is supported by a metal pedestal, and connected with a gas fixture by a tube. The coal-gas admitted mixes with the air, and burns at the top of the tube with an intensely hot, colorless flame.

How to measure heat: By the thermometer.

Electricity as a Source of Heat: Small electric stoves are provided, to be attached to the wire supplying the electric lights. The current flows through fine wires of high resisting powers embedded in fire-proof insulating cement in the base of the stove. The heat is produced by the resistance, and warms the top plate.

Thermometer: A thermometer consists of a glass tube with capillary bore sealed at one end, and the other end terminating in a bulb. The bulb is filled with mercury or other fluid, which, being expanded by heat, rises in the tube and indicates the degree of heat, either on an index scratched on the tube itself, or marked on a piece of paper against which the tube is placed.

Three scales for marking thermometric degrees now in use: The scales are, 1. Centigrade; 2. Fahrenheit, and 3. Réaumur. In the Centigrade scale, the freezing-point of water is zero, the boiling-point 100°, and the intervening space is divided into 100 equal parts called degrees. In the Fahrenheit scale, the freezing-point of water is 32°, the boiling-point 212°, and the intervening space is divided into 180 equal parts called degrees. In the Réaumur scale, the freezing-point is zero, and the boiling-point 80°.

Ratio the three scales bear to each other, and how to convert the scale of one into the other: Ratio: 5 : 9 : 4.

FORMULÆ FOR THE CONVERSION OF DEGREES OF ONE THERMOMETRIC SCALE INTO THOSE OF ANOTHER.—*Attfield.*

F. = Fahrenheit. C. = Centigrade. R. = Réaumur. D. = Observed Degree.

If above the freezing-point of water (32° F.; 0° C.; 0° R.).

F. into C.,....... $(D - 32) \div 9 \times 5$
F. " R.,....... $(D - 32) \div 9 \times 4$
C. " F.,....... $D \div 5 \times 9 + 32$
R. " F.,....... $D \div 4 \times 9 + 32$

If below 0° F. (− 17.77° C.;−14.22° R.).

F. into C. ....$-(D + 32) \div 9 \times 5$
F. " R.,....$-(D + 32) \div 9 \times 4$
C. " F.,....$-(D \div 5 \times 9) - 32$
R. " F.,....$-(D \div 4 \times 9) - 32$

If below freezing, but above 0° F. (−17.77° C.; −14.22° R.).

F. into C.,....$-(32 - D) \div 9 \times 5$
F. " R.,....$-(32 - D) \div 9 \times 4$
C. " F.,....... $32 - (D \div 5 \times 9)$
R. " F.,....... $32 - (D \div 4 \times 9)$

For all degrees,

C. into R.,............. $D \div 5 \times 4$
R. " C.,............. $D \div 4 \times 5$

RULES.

1. To convert Centigrade degrees into those of Fahrenheit above 32, multiply by 1.8 and add 32.

2. To convert Fahrenheit degrees above 32 into those of Centigrade, subtract 32 and divide by 1.8.

How to select a thermometer: Choose one made of glass, thick enough to be strong, but thin enough to be delicate, with graduations marked on tube, which should be of equal diameter throughout, with flat or elliptical, perfectly uniform bore. It should be free from air, which may be tested by inverting the instrument and seeing that the mercury descends to the lowest part of the tube.

Melting-point: Temperature at which a substance melts or fuses. **Use:** Means of identifying a body or proving its purity.

Blow-pipe, and how used: A slightly conical, gradually tapering metallic or glass tube, covered at the smaller end, and having a minute orifice at that end for producing a blast. When used, an unremitting current of air is forced through the tube from the mouth, by keeping the cheeks distended with air, and constantly supplying fresh air from the lungs, as needed.

Nature of the blow-pipe blast: First, it has an intense heat. Second, when used with a luminous flame, the interior of the blow-pipe blast, owing to the carbon not being wholly oxidized, has the power of reducing oxides. It is, therefore, called the *reducing* flame. The outer part of the blast has the opposite or oxidizing property, and is called the *oxidizing* flame.

What the blow-pipe is used for in Pharmacy: Used for bending and working glass, testing fusible chemical substances, in soldering, etc.

Crucible, and for what used: A crucible is a cup-shaped vessel, intended to withstand a powerful heat. Clay, plumbago, porcelain, iron, silver, and platinum, are some of the materials employed for crucibles. Platinum ranks first, plumbago second, the Hessian crucible next, though quite inferior; then come the more fragile porcelain and wedgwood crucibles, which must be gradually cooled, to prevent breakage.

Eight processes in Pharmacy require the application of high heat: 1. *Ignition.* 2. *Fusion.* 3. *Calcination.* 4. *Deflagration.* 5. *Carbonization.* 6. *Torrefaction.* 7. *Incineration.* 8. *Sublimation.*

Description of each of these processes: 1. *Ignition* consists in strongly heating solid or semi-solid substances to obtain a definite residue.

Ex.: The official quantitative tests for purified sulphide of antimony, phosphoric acid, etc.

2. *Fusion* is the process of liquefying solid bodies by heat. Ex.: Melting of iron or lead, or of wax.

3. *Calcination* is the process of driving off volatile substances, such as gas or water, from inorganic matter, by heat without fusion. Ex.: Magnesia, lime, etc., prepared by calcination.

4. *Deflagration* is the process of heating one inorganic substance with another capable of yielding oxygen (usually a nitrate or a chlorate); decomposition ensues, accompanied by a violent, noisy, or sudden combustion. Ex.: Salts of As and Sb made by this process.

5. *Carbonization* is the process of heating organic substances *without* the access of air, until they are *charred*. The volatile products are driven off, but combustion is prevented. Ex.: Charcoal is made in this way.

6. *Torrefaction* is the process of roasting organic substances. The constituents are modified but not charred. Ex.: The roasting of coffee. *Torrefied Rhubarb* is obtained in this way. It loses its cathartic properties by this process, but retains its properties as an astringent.

7. *Incineration* means the burning of organic substances to ashes in

air. The ash is the part sought. Ex.: Determining the amount of fixed matter in organic substances by burning them and examining the ashes.

8. *Sublimation* is the process of distilling solid volatile substances from non-volatile substances. Ex.: Camphor is separated from strips of wood from the camphor tree in this way.

Various forms of apparatus used to modify and control heat: The water-bath, salt-water bath, sand-bath, oil-bath, glycerin-bath, etc.

Limit of range of the several forms of bath: The water-bath can only be used for temperatures below 100° C. (212° F.). Saturated salt solution boils at 108.4° C. (227.1° F.), which degree limits the range of the salt-water bath. Glycerin may be heated to 250° C. (480° F.) without much inconvenience from the Acrolein, which is produced when that substance is raised nearly to the boiling-point. The oil-bath is designed to furnish a regulated temperature below 260° C. (500° F.), and the sand-bath may be used at any temperature.

Theory for the use of Steam in pharmaceutical operations: Matter exists in three forms, *solid*, *liquid*, and *gaseous*, depending upon the degree of distance between its molecules. Heat is but another name for molecular motion (possibly atomic motion also). Increase molecular motion, and molecular distance is increased to give room between the molecules for that motion. Cohesion holds molecules together. Heat, therefore, works against cohesion. If water is heated until its molecules are driven far apart, it becomes steam, and its molecules are now in very rapid vibration. If brought into contact with a cool surface, that is, a surface of slower molecular vibration, it imparts its motion to that surface, and the steam is condensed—its motion is lost, and it returns to the condition of fluid again. But by imparting its heat (motion) to the surface with which it came in contact, this surface becomes heated. The molecular motion of the surface becomes as great as the steam when equilibrium is attained and the temperature of the surface remains constant. As hot steam can be transported long distances by insulated pipes, it becomes a convenient means of heating surfaces at a distance from the fire, and the pressure of the steam being under perfect control, the temperature may be regulated with great exactness.

Two forms in which steam is used for heating: Steam without pressure, and steam under pressure, or superheated steam.

TABLE OF THE TEMPERATURES OF SUPERHEATED STEAM.

PRESSURE.	TEMPERATURE OF STEAM.		PRESSURE.	TEMPERATURE OF STEAM.	
Pounds per Square Inch.	C.	F.	Pounds per Square Inch.	C.	F.
14.7	100°	212°	55	141 6°	287°
17	104.2°	219.6°	60	144.7°	292.7°
20	108.8°	228°	65	147.7°	298°
23	113°	235.4°	70	150.5°	302.9°
25	115.6°	240.1°	75	153°	307.4°
30	121.3°	250.4°	80	155.5°	312°
35	126.2°	259.3°	85	157.8°	316.1°
40	130.7°	267.3°	90	160°	320°
45	134.6°	274.4°	95	162.2°	324°
50	138.3°	281.0°	100	164.4°	327.9°

Advantage of steam under pressure: Steam under pressure is hotter because more heat is required to raise water to the condition of vapor against increased pressure.

The way steam may be used under pressure for evaporation: By means of jacketed kettles.*

How the heating surface may be increased in such kettles: By combining the kettle with a steam coil.

Other purposes for which steam coils are used: For heating apartments, drying ovens, evaporating dishes placed upon them, and for boiling water, by placing a steam coil in the water.

OPERATIONS REQUIRING HEAT.

Vaporization: The operation of increasing molecular motion by heat until matter assumes the form of vapor or gas.

Explanation of what is meant by the various terms, Evaporation, Distillation, Desiccation, Exsiccation, Granulation, Sublimation: In the vaporization of liquids, when the object sought is the fixed part, the process is called *evaporation*. When it is the volatile part that is sought, it is called *distillation*. If solids are vaporized, when the fixed part is sought, the process is called *desiccation*, or *exsiccation*, and when furnished in a granular condition, *granulation*, but if the volatile part is sought, it is called *sublimation*.

Ebullition, or boiling: A violent agitation in a liquid produced when it is heated from the fluid to the gaseous condition. The heat acts first on that portion of liquid resting against the heated surface, converting a portion into steam, which rises in the form of bubbles, which break on the surface of the liquid.

What is meant by the boiling-point of a liquid: The temperature at which it boils. Each liquid has its specific boiling-point as well as its specific weight. Liquids evaporate more or less at all temperatures, hence there seems to be no specific *evaporating*-point, but there is a specific point where ebullition commences.

What is meant by the tension of vapor: The molecules of which vapor is composed repel each other, but are held together by cohesion and atmospheric pressure. Matter is, therefore, said to exist in a state of tension. The repelling force may be heat; at any rate, by increasing heat, or molecular motion, the repelling force is increased. Heat, therefore, is a force working against cohesion and atmospheric pressure, to force the molecules apart.

How advantage may be taken of the knowledge of tension to increase the rapidity of evaporation: By removing the pressure of the atmosphere from a liquid and increasing its molecular motion—viz., heating it—evaporation is hastened.

What important factor plays a part in the evaporation of a liquid in the open air: The degree of moisture already in the air.

In evaporating liquids at the boiling-point, temperature, press-

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* For various forms of jacketed kettles, boilers, etc., for using steam in pharmaceutical operations see Remington's "Pharmacy."

ure, etc., being equal, what determines the rapidity of evaporation: The amount of surface exposed to the heat.

What determines the rapidity of evaporation under like circumstances below the boiling-point: The amount of surface exposed to the air.

How to apply this knowledge: By selecting suitable vessels for evaporation, and employing various devices to increase the heating surface, or the surface exposed to the air, depending upon the method of evaporation chosen.

Vacuum pan: A covered evaporating pan, with an air pump, condenser, etc., for removing the pressure of the atmosphere while conducting the process of evaporation, thus enabling the liquid to boil at a lower temperature.

Evaporating chamber: A species of "fume-closet," built into a chimney breast, provided with gas-burners, etc., for conducting evaporation.

Spontaneous evaporation: Evaporation of a liquid at the ordinary temperature of the atmosphere, or without the application of strong direct heat. Conducted in drying-rooms or closets, or by using a tripod with long legs over a stove, or evaporating over a register.

How to protect a vessel from unequal heating by the flame when evaporating by direct heat: By a piece of wire gauze between it and the flame.

How to evaporate a liquid to a fixed weight: Use a tared dish, and weigh both dish and contents when required.

How to evaporate to a fixed volume: Use a graduated evaporating dish, and evaporate to the required volume.

How to mark the evaporating dish to determine the required volume: Dishes may be bought already graduated, or graduated in the laboratory, either by marking the dish on the inside or pasting a strip of paper to the inside, marked with the required measure. A strip of wood placed across the top of the dish, perforated in the middle for a glass thermometer, can be used for graduating purposes, by tying a string on the thermometer to indicate the desired level.

Hood: A contrivance connected with a chimney to place over evaporating dishes, etc., to conduct away vapors.

Grommet: A circular bit of rubber hose upon which a round-bottomed dish may be placed to keep it from turning over.

Distillation: The operation of separating one liquid from another, or a liquid from a solid, by *vaporization* and *condensation*, the volatile part being the object sought.

About how much water is required to condense steam at 100° C. (212° F.): About twenty-five times its weight of water at 20° C. (68° F.).

The two typical forms of apparatus used in distillation: First, the *alembic* consists of a *head* or *dome*, in which the vapors generated in the *body* or *cucurbil* are condensed and run into a gutter at the base of the dome, and are carried off by a pipe. The use of the alembic in its original form is nearly obsolete. Second, the retort consists of a long-necked flask, with the neck bent at right angles with the body of the flask. When the flask has a *tubulure*, or orifice at the top of the body, for the purpose of introducing the liquid to be distilled, it is called a *tubulated* retort. Other materials, besides glass, are used for making retorts.

How to select a retort: For very volatile liquids a deep retort is preferable. The bottom of the neck should form an acute angle with the body. The tubulure should be situated well back, to admit a funnel without striking the bottom of the neck. The neck should taper gradually, permitting the use of a rubber ring, to form a tight joint between it and the condenser, the ring being made tight by forcing it up the gradually tapering neck. The glass should neither be too thick nor too thin, well annealed, and free from scratches, bubbles, and imperfections.

How to improvise an ordinary flask for distillation: Select a flat-bottomed flask, with a wide mouth, to admit a large-sized rubber stopper containing a wide, bent tube, to act as a neck, a thermometer, and a safety or changing tube. The joints are made tight by *luting* them.

Lute: Various pastes, which harden when dry, and serve to make joints vapor-proof, are called lutes. Flax-seed meal poured into boiling water and stirred into a paste is generally used.

How glass tubes may be connected with each other: By rubber tubing, or pieces of bladder moistened and wrapped around the proposed joint, and tying with strong linen twine.

Receivers: Glass vessels, usually globular in shape, for receiving distillates. Three kinds are used—plain, *tubulated*, and *quilled*. The tubulure is to prevent explosions, and the quill to allow the distillate to escape, for the purpose of measuring it as it condenses.

Adapters: Tapering tubes of glass, used to connect retorts with receivers.

How to charge a retort: A plain retort should be charged with a long-beaked funnel, reaching well down into the body of the retort. Place a funnel in the tubulure, to charge a tubulated retort.

How retorts are supported: By retort stands, of which there are several patterns.

What is meant by bumping, and how it may be prevented: Certain explosions occurring in a liquid when it is boiled. It may be prevented by placing some pieces of broken glass in the retort.

Liebig's Condenser: Two long tubes, the smaller inside the larger, and sufficient space between them to allow the free circulation of water, are kept in place by rubber rings between them at each end of the apparatus. The inside tube is longer, to allow it to be connected at one end with a retort, and the other end with a receiver. The apparatus is inclined at an angle on a stand, and, when in use, cold water is circulated between the tubes, entering at an orifice situated at the lower end, and escaping at a similar orifice situated at the top, thus condensing the vapors passing through the inner tube.

Still: Various forms of apparatus embracing the principles of the alembic and retort, either singly or combined, used for distillation, are called stills. When the neck of the retort is prolonged into a coil and immersed in water to condense the vapors, it is called a *worm*.

Sublimation: The process of distilling volatile solids. The product is called a *sublimate.*

Description of the product: First, Cake sublimate; second, Powder sublimate: When the volatile product condenses at a temperature but slightly lower than the condensing point, the deposit is made slowly and a large cake of crystals is produced. But if the vapor is condensed rapidly in a cold temperature, a powder results. Retorts and hoods of various patterns are used for sublimation, or the vapor may be condensed in chambers specially arranged for the purpose.

Desiccation: The operation of drying medicinal substances.

The three objects for drying medicinal substances: 1. To aid in preserving them. 2. To reduce their bulk. 3. To facilitate their comminution. The operation is effected by various forms of ovens and drying closets, described in works on pharmacy.

OPERATIONS NOT REQUIRING HEAT.

Comminution: The process of tearing drugs to pieces or reducing them to powder.

Some of the processes for comminuting drugs: Cutting, rasping, grating. chopping, contusing, rolling, stamping, grinding, powdering, triturating, levigating, elutriating, granulating, etc.

Instruments used for cutting, slicing, or chopping: Pruning-knife, pruning-shears, tobacco-knife, or herb-cutter.

Instrument used for grating: Half-round rasp.

Instruments used for contusion: Iron pestle and mortar, or the pestle and mortar may be made of wood or marble.

Meaning of the terms Grinding and Pulverizing: Grinding means reducing substances to *coarse* particles. Pulverizing means reducing to *fine* particles.

Drug Mill: A mill for comminuting drugs.

Four general divisions of drug mills: Burr-stone mills, roller mills, chaser mills, and hand mills.

Principle of each: A burr-stone mill consists of two disks of stone, rubbing together, the approximating faces being cut in grooves, to afford grinding surfaces

Roller mills consist of rollers revolving in opposite directions, the distances between them being regulated by screws. They operate by crushing, or cutting and crushing, and the rollers are made smooth, or with corrugations, serrations, undulations, or crenations, according to the nature of the drug which is to be operated on.

Chaser mills consist of two heavy granite stones revolving on a circular granite base, surrounded by an iron curb. They operate by crushing and by the friction engendered by the outer edge of the stone traveling through a longer distance than the inner edge.

Hand mills are divided into three classes, according to the arrangement of their grinding surfaces, which may be *vertical, horizontal* or *conical.* They are made of iron, with grinding plates of hardened iron or steel, and thumb-screws to regulate the distance between the grinding faces.

Trituration: Rubbing substances to fine particles by means of a pestle and mortar.

The process: Give the pestle a circular motion with downward pressure. Commencing in the center of the mortar, work outward in ever increasing circles till the side of the mortar is touched, then reverse the motion and decrease the size of the circles till the center is reached.

How a pestle should fit its mortar: See that the pestle has as much bearing on the interior surface of the mortar as its size will permit, to secure as much triturating surface as possible.

Substances of which pestles and mortars for trituration are composed: Wedgwood, porcelain, and glass.

Spatula: A flexible steel blade fixed in a handle, and used for various purposes in pharmacy. In trituration it may be used to loosen up the substance when it becomes packed upon the sides of the mortar. The best form of spatula is that known as the balance handle.

Fineness of powders—how regulated: By sieves of various construction, with meshes of different sizes, as required. It is important that all portions of the sifted powder be thoroughly mixed, in order to secure uniform composition.

Powders are known as *very fine* (sieve with 80 meshes to the linear inch); *fine* (60 m. to l. i.); *moderately fine* (50 m. to l. i.); *moderately coarse* (40 m. to l. i.); *coarse* (20 m. to l. i). These powders are also known by number, as Nos. 80, 60, 50, 40, and 20, respectively. Iron wire, brass wire, bolting cloth, and horsehair are the materials usually chosen for sieves.

Levigation: "The process of reducing substances to a state of minute division by triturating them after they have been made into paste with water or other liquid." A slab and muller is the apparatus used for this process. When this is constructed of porphyry, the process is termed *porphyrization*.

Elutriation: If an insoluble powder be suspended in water the heavier particles will precipitate first. By decantation of the liquid, the finer portions may be separated. Prepared chalk is a familiar example. The process of making the pasty mass obtained by elutriation into little cones is called TROCHISCATION. A tinned iron cone, with a handle, is used for this purpose. The handle has a short leg in the center, which is tapped gently on a slab, upon which the substance forced through the aperture at the bottom of the cone by the shock falls, in the form of a little conical mass. Successive shocks are employed, and the resulting conical masses deposited in this manner on the slab soon dry, the moisture being absorbed by the slab.

Pulverization by intervention: The process of reducing substances to powder through the use of a foreign substance, from which the powder is subsequently freed by some simple method. Ex.: Camphor may be powdered with the aid of a few drops of alcohol. The foreign substance is freed from the powder by subsequent evaporation.

SOLUTION.

Solution: The permanent and complete incorporation of a solid or gaseous substance with a liquid. The product is called a *solution*, the liquid used a *solvent*, and if the solvent will dissolve no more of the substance, the product is called a *saturated solution*.

Difference between simple and chemical solution: In simple solution no change occurs in the chemical structure of the dissolved substance (sugar in water); but in chemical solution the reverse is the case. Ex.: The official solution of nitrate of mercury.

How solution of solids may be facilitated: By pulverizing the substance the extent of surface exposed to the solvent is increased, and by agitation the frequency of the contact is augmented, thus favoring the rapidity of solution. Heat, by causing convection currents in the liquid, facilitates solution, and as heat works against cohesion, it increases the solubility of the substance.

Saturated solutions as solvents: A liquid saturated with one substance is still a solvent for another substance.

Effect of solution upon temperature: Simple solution lowers temperature; chemical solution raises temperature.

Best manner of effecting the solution of a solid: Crush the substance in a mortar with the pestle, then pour on the solvent, continually stirring the mixture.

Circulatory solution: If the substance be placed in a bag and suspended in the solvent, a current will be engendered by the sinking of the dissolved portion from the bag, its place being supplied by fresh portions of the solvent.

Solvents used in pharmacy: Water, first in importance, then Alcohol, Glycerin, Ether, Benzin, Chloroform, Bisulphide of Carbon, Acid, and Oils, take their respective rank as solvents.

How to effect the solution of a gas in water: Apparatus is so arranged that the gas first passes through a wash-bottle, by which it is purified, and then allowed to bubble up through the solvent, which absorbs a portion of it during the passage.

SEPARATION OF FLUIDS FROM SOLIDS.

Some of the processes for separating fluids from solids: Lotion, Decantation, Colation, Filtration, Clarification, Expression, Percolation, etc.

Lotion or displacement washing: The process of separating soluble matter from a solid, by pouring a liquid upon it, which will dissolve and wash out the soluble portion. Ex.: The washing of a precipitate in a funnel by means of a Spritz bottle.

Various automatic apparatus for continuing washing are described in works on pharmacy.

Decantation: Separating a liquid from a solid by pouring it off. This is sometimes better effected by a siphon.

Siphon: A siphon is an inverted U-tube, with one leg longer than the other. It is first filled with the liquid, and the shorter arm immersed in the liquid contained in the vessel, and a current established in this way: The column of liquid in the shorter arm is overbalanced by the column in the longer arm, thus causing a current to flow from the shorter to the longer arm, the shorter arm drawing a fresh supply from the vessel, which is thus finally emptied.

Colation, or straining: The process of separating a solid from a fluid, by pouring the mixture upon a cloth or porous substance, which will permit the fluid to pass through, but will retain the solid.

Material used for constructing Strainers: Gauze, Muslin, Flannel, Felt, etc.

Filtration: The process of separating liquids from solids, with the view of obtaining the liquids in a transparent condition. *Filters* are made of paper, paper pulp, sand, asbestos, ground glass, charcoal, porous stone, etc.

Two general classes of paper filters: Plain and plaited. Plain filters are used for retaining and washing precipitates; plaited filters for ordinary filtering operations.

How paper filters are supported: In funnels.

Method for producing rapid filtration: Various methods are used, such as suction with the mouth, or by a column of falling water, to produce a partial vacuum beneath the filter, and thus hasten the process by increasing atmospheric pressure.

Clarification: The process of separating from liquids, without the use of strainers or filters, solid substances which interfere with their transparency.

Eight principal methods of clarification:

1. *By the Application of Heat.* Heat, by diminishing the specific gravity of viscid liquids, permits the precipitation of the heavier particles, the lighter ones rising to the top. Boiling facilitates the separation, as the minute bubbles of steam adhere to the particles, and rise with them to form scum, which may be skimmed off.

2. *By increasing the Fluidity of the Liquid.* This may be done by diluting it with water. Owing to the diminished specific gravity, the heavier particles sink, and the liquid may then be decanted.

3. *Through the use of Albumin.* If albumin be added to the turbid liquid, and heat applied, on coagulating it will envelop the particles, and rise to the top with them. Skimming will remove the scum.

4. *Through the use of Gelatin.* Gelatin will form with tannin an insoluble compound, and where cloudiness is due to the presence of tannin, will clarify the liquid in this way.

5. *Through the use of Milk.* Acids will precipitate the casein of milk. It is used in sour wines, etc., the precipitated casein carrying with it the insoluble particles.

6. *Through the use of Paper Pulp.* Agitate the liquid with the pulp and let it stand till clear; or throw the whole on a muslin strainer; the pulp will form an excellent filtering medium by partially closing the meshes of the linen.

7. *By Fermentation.* Many substances soluble in the natural juices

of plants are insoluble in the dilute alcoholic solutions resulting when these juices are fermented and subside as deposits.

8. *By subsidence through long standing.* The deposit formed is called a *sediment.*

Difference between a Sediment and a Precipitate: "Sediment is solid matter separated merely by the action of gravity from a liquid in which it has been suspended. A precipitate, on the other hand, is solid matter separated from a solution by heat, light, or chemical action."

Decoloration: The process of depriving liquids or solids in solution of color by the use of animal charcoal.

How to separate Immiscible Liquids: By the use of a pipette, a glass syringe, a separating funnel, or a Florentine receiver. A funnel with a stop-cock to stop the flow as soon as the heavier liquid has all passed through is called a separating funnel. A Florentine receiver, used in the distillation of volatile oils, differs from an ordinary receiver in having an overflow arranged to permit the escape of the condensed water while retaining the volatile oil.

Precipitation: "The process of separating solid particles from a solution by the action of heat, light, or chemical substances." The solid particles separated are called the *precipitate;* the precipitate producer, a *precipitant;* and the liquid remaining, *supernatant liquid.* A precipitate may either fall or rise to the top of the supernatant liquid. The physical characteristics of precipitates are described by the words *curdy*, *granular*, *flocculent*, *gelatinous*, *crystalline*, *bulky*, etc. A *magma* is a thick, tenacious precipitate. Precipitation by heat is illustrated by the coagulation and precipitation of albumin when albuminous fluids are heated; and the precipitation of silver salts by light illustrates precipitation by light; and precipitation by chemical reaction occurs in a large number of instances when making official chemical salts. Ex.: the preparation of Precip. Carb. Calcium.

Objects of precipitation: 1. A method of obtaining substances in the form of powder. 2. A method of purification. 3. A method of testing chemicals. 4. A method of separating chemical substances.

Vessels of glass called precipitating jars are made. They are larger at the bottom than the top. Hot, dense solutions usually produce heavy precipitates, and the reverse is the case when dilute solutions are employed. Precipitates may be collected in a funnel on filtering paper or on strainers.

CRYSTALLIZATION.

Crystallization: The process of placing substances under the most favorable circumstances for them to assume certain inherent geometrical forms called *crystals.* Substances that will not crystallize are called *amorphous.* *Crystallography* is that department of knowledge devoted to crystals. The objects of crystallization are to increase the purity and beauty of chemicals.

1. MEANING OF TERMS.

Faces—the planes bounding a crystal.
Edge—the intersection of two contiguous surfaces.

Angle—the intersection of three or more faces.

Perfect crystal—a crystal in which the faces, edges, or angles have equal faces, edges, or angles opposite to them, and if the middle point of the opposite faces or edges or the opposite angles be joined by straight lines, the point at which these lines intersect will be the center of the crystals.

Axes—the lines drawn through the center of crystals.

Dimorphous, trimorphous, polymorphous, etc.—when the same body crystallizes in two or more forms belonging to different systems.

Isomorphous—when *different* substances crystallize in the same form.

Prismatic—crystals extended principally in the direction of their longer axes.

Tabular—crystals with flat planes.

Laminæ—crystals in the form of thin plates.

Acicular—needle-shaped.

Orthometric—those in which the three axes intersect at right angles.

Clinometric—those in which the axes intersect at oblique angles.

2. SYSTEMS.

Six different systems of crystallization are recognized. The word system is used because "every crystallizable body assumes its own characteristic form or some form directly derived from it by a single law," so that several forms may belong to the same system.

I. *Monometric* or *Regular.*—The angles of equal length intersecting at right angles.

II. *Dimetric* or *Quadratic.*—Three axes, two equal, the other different in length, all intersecting at right angles.

III. *Trimetric* or *Rhombic.*—Three axes of unequal length intersecting at right angles.

IV. *Hexagonal* or *Rhombohedric.*—Four axes, three of equal length, in the same plane, and inclined to one another at an angle of 60 degrees. Fourth axis different length, and intersecting the planes of the other three at right angles.

V. *Monoclinic* or *Oblique Prismatic.*—Three axes of unequal length; two obliquely inclined to each other, the other axis forming right angles with these two.

VI. *Triclinic* or *Doubly-oblique Prismatic.*—Three axes of unequal length, all obliquely inclined to each other.

Cleavage: The tendency of crystals to split in one direction more than another.

Method of obtaining crystals: 1. By fusion and partial cooling (sulphur, camphor, etc.). 2. Sublimation (corrosive sublimate). 3. Deposition from hot, supersaturated solutions on cooling. 4. Deposition during evaporation. 5. Galvanism (deposited while current is passing through solution). 6. Precipitation. 7. By adding a solid substance having a strong affinity for water. (If $CaCl_2$ be added to a solution of NaCl, the latter will crystallize out.)

Water of Crystallization: In the act of crystallizing, many substances combine with water. This is known as water of crystallization.

The amount varies in the same crystal under different circumstances. When crystals lose their water of crystallization, and form a white powder on their surfaces, they are said to *effloresce*. Crystals that absorb water from the air are said to be *hygroscopic*. The act is called *deliquescence* when sufficient water is absorbed to liquefy the substance.

Mother liquor: The liquid remaining after the crystals have formed.

Granulation: The process of heating the solution of a chemical substance, with constant stirring, until the moisture has evaporated, and a sabulous, coarse-grained powder is produced.

Granular Effervescent Salts: Three methods of preparation: 1. The old method consisted of mixing the dry powders with dry tartaric acid and sodium bicarbonate, moistening with strong alcohol, passing the pasty mass through a sieve, drying the granules in a hot room, sifting, filling, and hermetically sealing the bottles. 2. The improved method dispenses with the alcohol and uses citric acid to replace part of the tartaric acid. The molecule of water of crystallization is liberated when citric acid is treated with sodium bicarbonate, furnishing sufficient water to form the pasty mass, without much loss of CO_2. Further chemical action is prevented by quickly drying the granules. 3. E. F. Cook's improved process (1903) consists of mixing the powders on a glass plate, gently heating in an oven, manipulating with a wooden spatula, rubbing through a sieve, and drying the granules in an oven.

Exsiccation: Depriving a solid crystalline substance of its water of crystallization or moisture by heating it strongly.

Dialysis: The separation of crystallizable from non-crystallizable substances by osmosis.

Dialyzer: A vessel with a parchment head, like a drum-head, at one end, into which the substances to be separated are placed in the form of solution. This is floated on distilled water, and by osmosis the crystallizable substance transudes through the membrane into the water below, leaving the non-crystallizable substance behind.

Crystalloids.—Crystallizable substances—sugar, salt, chemical substances.

Colloids.—Non-crystallizable substances—glue, gum, starch, dextrine, etc.

Diffusate.—The impregnated distilled water.

Extraction: The separation of the soluble principles from drugs by treating them with a liquid in which the principles are soluble. The solvent is called a *menstruum*.

Five modes of extraction: 1. Maceration and expression. 2. Percolation. 3. Digestion. 4. Infusion. 5. Decoction.

Maceration: Soaking a drug in a solvent until the soluble portions are dissolved.

Expression: The process of *forcibly* separating liquids from solids.

Six mechanical principles employed in constructing presses: 1. Spiral-twist Press. 2. Screw Press. 3. Roller Press. 4. Wedge Press. 5. Lever Press. 6. Hydraulic Press. (For full descriptions of these presses, see Remington's "Pharmacy.")

Digestion: Maceration with gentle heat.

PERCOLATION.

Percolation: Percolation, also called **Displacement,** is the process whereby a powder contained in a suitable vessel is deprived of its soluble constituents by the descent of a solvent through it.

Familiar example: The percolation of water through wood ashes, by which it is exhausted of its potash, etc., the solution being known as lye.

Use of this process in Pharmacy: It is used for extracting the virtues of drugs, in the preparation of tinctures, fluid extracts, etc.

Percolator: A percolator is a cylindrical vessel with a porous diaphragm below, into which the drug, in the form of a powder, is introduced, and its soluble portions extracted by the descent of a solvent through it.

Rationale of the process: The solvent, which is poured on the top of the powder, in passing downward exercises its solvent power on the successive layers of the powder until saturated, and is impelled downward by the combined force of its own gravity and that of the column of liquid above, minus the capillary force with which the powder tends to retain it.

Menstruum: The solvent is known technically by this name.

Percolate: The liquid coming from the percolator, impregnated with the soluble principles of the drug.

Why percolation is also called the process of displacement: Because it was first observed that ether, poured on powdered bitter almonds, displaced the fixed oil which it contains without materially mixing with it.

Condition in which the soluble principles exist in the powdered drug, and the effect of the solvent upon them: The soluble principles in the powdered drug exist in a hard and dry condition, and are generally contained in cells which are more or less disintegrated in grinding. The solvent takes up first the principle liberated by grinding, and afterward permeates the cells.

Why each succeeding portion of percolate is less highly colored and less active than the one preceding it: Because the first portion of menstruum, in its descent through the powder, has the first opportunity to come in contact with the largest portions of the soluble principles, which are to be found in the finer dust scattered through the powder, and in the thoroughly disintegrated particles, which offer but slight resistance to the passage of the menstruum.

DIRECTIONS OF THE U. S. P. UPON PERCOLATION.

Percolation, as directed in this Pharmacopœia, consists in subjecting a substance, in powder, contained in a vessel called a percolator, to the solvent action of successive proportions of menstruum in such a manner that the liquid, as it traverses the powder in its descent to the receiver, shall be charged with the soluble portion of it, and pass from the percolator free from insoluble matter.

When the process is successfully conducted, the first portion of the liquid, or percolate, passing through the percolator will be nearly saturated with the soluble constituents of the substance treated; and if the quantity of menstruum be sufficient for its exhaustion, the last portion of the percolate will be nearly free from color, odor, and taste, other than those of the menstruum itself.

The Percolator most suitable for the quantities contemplated by this Pharmacopœia should be nearly cylindrical, or slightly conical, with a funnel-shaped termination at the smaller end. The neck of this funnel end should be rather short, and should gradually and regularly become narrower toward the orifice, so that a perforated cork, bearing a short glass tube, may be tightly wedged into it from within until the end of the cork is flush with the outer edge of the glass tube, which must not project above the inner surface of the cork, should extend from 3 to 4 Cm. beyond the outer surface of the cork, and should be provided with a closely-fitting rubber tube, at least one-fourth longer than the percolator itself, and ending in another short glass tube, whereby the rubber tube may be so suspended that its orifice shall be above the surface of the menstruum in the percolator, a rubber band holding it in position.

The shape of a percolator should be adapted to the nature of the drug to be operated upon. For drugs which are apt to swell, particularly when a feebly alcoholic or an aqueous menstruum is employed, a *conical* percolator is preferable. A *cylindrical* or only slightly tapering percolator may be used for drugs which are not liable to swell, and when the menstruum is strongly alcoholic, or when ether or some other volatile liquid is used for extraction. The size of the percolator selected should be in proportion to the quantity of drug to be extracted. When properly packed in the percolator, the drug should not occupy more than two-thirds its height. The percolator is best constructed of glass, but unless otherwise directed, may be made of any suitable material not affected by the drug or menstruum.

The percolator is prepared for percolation by gently pressing a small tuft of cotton into the neck above the cork, and this may be moistened by pouring a few drops of the menstruum upon the cotton, to facilitate the passage of the first portion of percolate, which is often very dense.

The Process.—The powdered substance to be percolated (which must be uniformly of the fineness directed in the formula, and should be perfectly air-dry before it is weighed) is put in a basin, the specified quantity of menstruum is poured on, and the powder is thoroughly stirred with a spatula or other suitable instrument, until it appears uniformly moistened. The moist powder is then passed through a coarse sieve—No. 40 powders, and those which are finer, requiring a No. 20 sieve; whilst No. 30 powders require a No. 15 sieve for this purpose. Powders of a less degree of fineness usually do not require this additional treatment after the moistening. The moist powder is now transferred to a sheet of thick paper, and the whole quantity poured from this to the percolator. It is then shaken down lightly and allowed to remain in that condition for a period varying from fifteen minutes to several hours, unless otherwise directed; after which the powder is pressed, by the aid of a plunger of suitable dimensions, more or less firmly, in proportion to the character of the powdered substance and the alcoholic strength of the menstruum, strongly alcoholic menstruum, as a rule, permitting firmer packing of the powder than the weaker. The percolator is now placed in position for percolation, and the rubber tube having been fastened at a suitable height, the surface of the powder is covered by an accurately fitting disk of filtering paper, held in place by a glass stopper or percolator weight, and a sufficient quantity of the menstruum poured on through a funnel reaching nearly to the surface of the paper. If these conditions are accurately observed, the menstruum will penetrate the powder equally until it has passed into the rubber tube and has reached, in this, a height corresponding to its level in the percolator, which is now closely covered to prevent evaporation. The apparatus is then allowed to stand at rest for the time specified in the formula.

To begin percolation, the rubber tube is lowered and its glass end introduced into the neck of a bottle previously marked for the quantity of liquid to be received, if the percolate is to be measured, or of a tared bottle if the percolate is to be weighed; and by raising or lowering this recipient, the rapidity of percolation may be increased or lessened, as may be desirable. A layer of menstruum must constantly be maintained above the powder, so as to prevent the access of air to its interstices, until all has been added, or the requisite quantity of percolate obtained. This is conveniently accomplished, if the space above the powder will admit it, by inverting a bottle containing the entire quantity of menstruum over the percolator in such a manner that its mouth may dip beneath the surface of the liquid, the bottle being of such shape that its shoulder will serve as a cover for the percolator.

When the dregs of a tincture, or of a similar preparation, are to be subjected to percolation, after maceration with all or with the greater portion of the menstruum, the liquid portion should be drained off as completely as possible, the solid portion packed in a percolator, as before described, and the liquid poured on, until all has passed from the surface, when immediately a sufficient quantity of the original menstruum shall be poured on to displace the retained liquid, until the prescribed quantity has been obtained.

Repercolation.—Authority is given to employ, where it may be applicable, the process of repercolation, without change of the initial menstruum.

Rate of Flow.—It is obvious that the success of the process largely depends upon the regulation of the flow of the percolate; if this should be too rapid, incomplete exhaustion will result, but if too slow, valuable time may be wasted. The rate of flow for extracts and fluid extracts for 1000 Gm. of powder should range from two to five drops a minute; for official quantities of tincture and preparations of about the same strength, from eight to fifteen drops a minute, and the word "slowly" throughout the text is understood to mean a rate of flow corresponding to this; it is evident that the proper rate of flow should vary with the quantity and character of the drug employed and the density of the menstruum.

Maceration.—Percolation is not suitable for exhausting some drugs, and the process of maceration is employed for some of the tinctures (Aloes, Asafetida, Sweet Orange Peel, Tolu, etc.). Maceration should be conducted preferably at a temperature of about 15° to 20° C. (59° to 68° F.), and in a shady place.

Best percolator for common use: An ordinary glass funnel.

Objection to the glass funnel: It is too broad for use in percolating drugs for fluid extracts when the quantity of drug is large in proportion to the quantity of menstruum.

Desirable shape for making this class of preparations: A tall, narrow percolator.

Why: Because it is desirable that the menstruum should traverse a higher column of powder.

What is gained by this: First, every drop of menstruum is economically applied; second, the rate of flow is diminished; third, the percolate becomes saturated more rapidly; fourth, the operation is, therefore, more easily controlled.

General rule for selecting percolators: For making fluid extracts, a tall, straight percolator should be selected; for making a strong tincture, the percolator should be slightly bell-shaped and wider; for making weak tinctures, use a funnel.

How to limit these rules: The character of the drug influences the limit. Those containing a large amount of soluble matter, like kino, cannot be percolated in a tall, narrow funnel, because the percolate would soon become too dense to descend.

What influences the degree of comminution proper for each substance: It depends, first, upon the physical structure of the drug; second, the ease with which the menstruum dissolves the desired constituents; third, the length of time required to exhaust the powder; fourth, the relative proportion of menstruum to drug.

Why the Pharmacopœia directs that the drug shall be passed through a coarse sieve after moistening: To render it uniform.

Why the powder should be moistened: First, a moist powder, like a moist sponge, greedily absorbs moisture, but a dry powder, like a dry sponge, repels attempts to moisten it; second, dry powders have a tendency to swell when moistened, which, owing to the pressure of the particles against each other and the sides of the percolator, prevent moisture from penetrating them.

Exceptions to the rule for moistening powders: Powders should not be moistened, first, when the addition of the menstruum would produce lumping, owing to the adhesive nature of the drug; second, when the moistened powder would offer too little resistance to the passage of the menstruum; third, those in which the menstruum is too volatile or too inflammable to render moistening desirable or safe. The cold percolation of sugar in making syrups illustrates the first; the preparation of oleoresins with ether illustrates the second and third.

Of what the porous diaphragm should be composed: Porous cotton, a deeply notched cork, or a perforated plug of cork or wood.

The porous diaphragm should be covered with clean sand, or a disk of scored filter paper, except when absorbent cotton is used. *Always* moisten the porous diaphragm with a *portion of the menstruum* before packing the percolator.

How a percolator should be packed: It should be packed in layers, each succeeding layer being packed according to the directions, "moderately" or "firmly," as the case may be, care being taken to use the same degree of pressure with each layer.

How to test the correctness of the packing: By the descent of the menstruum, which should descend slowly and uniformly.

General rule in relation to the degree of pressure to use in packing percolators: Porous, spongy drugs, and menstrua largely aqueous, require moderate packing. If a strongly alcoholic menstruum is directed, pack firmly.

How to add the menstruum: Cover the top of the powder with a sheet of scored filter paper, place a weight upon it to keep it in place, and add the menstruum in divided portions, care being taken to follow with the succeeding portion before the first one has entirely disappeared, to prevent fissures forming in the powder, and the leaking of the menstruum through the fissures.

Why the Pharmacopœia directs previous maceration of the powder before percolation: Because most drugs are not easily extracted by the menstruum, owing to the toughness of the powder, or nature of the desired principles, and maceration secures contact with the solvent for a longer time.

How this maceration is best effected: By introducing the moistened drug loosely into the percolator, and covering it closely, to prevent loss by evaporation.

How it can be determined if the drug is exhausted: Only by knowing beforehand what the active principles of the drug are, and testing the percolate, until they are no longer contained therein.

For example: The absence of bitterness in the percolate, from nux vomica, opium, and cinchona, indicates that the bitter alkaloids, to which their activities are due, have been thoroughly extracted from the drug; the absence of color in the percolate of cochineal and saffron indicates that the desired coloring matters have been exhausted from the drugs, and the absence of astringency in the percolate, of drugs whose activities are due to tannic acid, indicates that it has been completely extracted.

Best menstruum for extracting a drug: The best menstruum for extracting a drug is one that will deprive it of its active and desirable principles, and leave in the residue those principles which are either inert or objectionable.

Other important points to be taken into consideration in choosing a menstruum: A menstruum should always be chosen exactly adapted to the characteristics of the drug, and which will cause the retention of the soluble principles in a permanent form under the varying conditions of climate, and at the same time permit exposure to light, heat, and air without injury.

How this can be determined: Only by experiment.

It cannot be accurately predetermined what amount of menstruum a powder will absorb and retain after percolation ceases:

The amount varies according to the nature of the drug employed, sometimes as much as eight to twenty per cent.

Great advantage percolation has over maceration in respect to the character of liquid left in the residue: Maceration leaves a finished tincture in the residue; in percolation it is merely menstruum, the active portions of the drug having been dissolved in the preceding percolate.

How retained menstrua can be recovered: By distillation, or by treating the residue, first with weak alcohol, then with water.

Expedients that may be resorted to when water causes a swelling of the substance and stops percolation: Mix the residue with clean sawdust, rice chaff, or other inert dry substances, then percolate with water.

How recovered distilled alcohol may be purified: By treating it with permanganate of potassium (12 grains to the gallon), letting it stand a few days, then decanting or filtering.

How to control the flow of the percolate in conducting the operation of percolation: By the amount of pressure in packing; by raising or lowering the receiver containing the nozzle of the delivery tube, as directed by the U. S. P.; by using a stop-cock (objectionable); or by adopting one of the several forms of percolators devised for that purpose.

Some of the special percolators devised as improvements on the ordinary cylindrical and conical percolators, and the principles upon which they are founded: 1. Drusse's glass percolator. In this percolator evaporation is prevented by means of a ground glass cover. The flow of the percolate is checked by screwing in the cover; should it flow too slowly, a piece of twine between the cover and the side will permit the necessary atmospheric pressure.

2. Squibb's Well-tube Percolator. In this percolator a large glass tube, called a well-tube, is placed in the center of a stoneware crock and slightly raised from the bottom by absorbent cotton; around it is packed the substance to be percolated, the menstruum is poured on the powder, trickles through and rises in the well, from which it is siphoned.

3. Double-tube Percolator. An ordinary percolator is used. In it is placed a well-tube, with a smaller tube telescoped therein, the end of the latter projecting for a few inches below the percolator through a tight-fitting cork. The well-tube rests on absorbent cotton. The menstruum percolates through the powder, permeates the cotton, and rises in the well-tube to the top of the smaller tube therein, over which it runs into the tube and out, being received in a vessel below. The height of the percolate in the well-tube, and consequently the rapidity of the flow, is controlled by raising or lowering the inner tube.

4. Suspended Percolator (Hance Bros. & White). This percolator is so arranged, being suspended by trunnions from a beam, that it can be readily turned upside down and emptied of its contents. It is suitable for large operations.

How to support a percolator: Several methods are in use: First, The ordinary retort stand (flimsy). Second, Remington's Percolating Stand; this instrument consists of two parallel shelves, one above the other; each shelf consists of two parallel strips having slots down the center, fastened to which, by thumb-screws working in the slots, are cross-pieces, having their inside edges hollowed out to receive the percolator. The cross-pieces may be slid either way to enlarge or reduce the space between them so as to fit percolators of all sizes. This excellent apparatus is suspended from the wall by brackets. The advantage is that it enables all percolating and filtering operations to be carried on with convenience in one place, thus saving time and labor. Third, Shinn's Percolating Closet consists of adjustable retort rings sliding up and down on gas-pipe supports, with conveniently arranged shelves, all enclosed in a convenient closet.

What kind of receiving bottles should be used for the percolate: Wide mouth bottles are preferred. Where special accuracy is required, use a flask with a double mark on the neck. Bottles may be graduated by pasting a paper slip on the side, pouring in accurately measured quantities of water, carefully marking the height at each addition. A strip of adhesive plaster answers an excellent purpose.

What is meant by repercolation: Repercolation is a process introduced by Dr. Squibb, and consists in "the successive application of the same percolating menstruum to fresh supplies of the substance to be percolated."

Its advantages: By passing the weaker portions of the percolate through fresh portions of drug, it becomes thoroughly saturated. In this way a portion of the percolate will do work as menstruum, resulting in the saving of menstruum.

Fractional percolation: A term used to define percolation when applied to two successive portions of powder. (Principle identical with repercolation.)

PART II.

THE FORMS OF PHARMACEUTICAL PREPARATIONS DIRECTED BY THE U. S PHARMACOPOEIA.

CLASSIFICATION OF OFFICIAL PREPARATIONS.

LIQUIDS.		SOLIDS.	
Made without percolation or maceration.	Made by percolation or maceration.	Made by percolation or maceration.	Made without percolation or maceration.
Aqueous Solutions.	*Aqueous Liquids.*	Extracts,	Powders,
Waters,	Infusions,	Resins.	Triturations,
Solutions.	Decoctions.		Masses,
Aqueous Solutions Containing Sweet or Viscid Substances.	*Alcoholic Liquids.*		Confections,
Syrups,	Tinctures,		Pills,
Honeys,	Wines,		Troches,
Mucilages,	Fluidextracts.		*Cataplasms,*
Emulsions,	*Ethereal Liquids.*		*Cerates,*
Mixtures,	Oleoresins.		*Ointments,*
Glycerites.	*Acetous Liquids.*		*Plasters,*
Alcoholic Solutions.	Vinegars.		*Papers,*
Spirits,			*Suppositories.*
Elixirs.			
Ethereal Solutions.			
Collodions.			
Oleaginous Solutions.			
Liniments,			
Oleates.			

Roman type, internal use. Italic type, external use.

LIQUIDS.

AQUEOUS SOLUTIONS.

AQUÆ—WATERS.

Aquæ, or **Waters:** Aqueous solutions of volatile substances. There are eighteen official waters.

Official Directions.—The medicated waters, when prepared from volatile oils, are intended to be, as nearly as practicable, saturated solutions, which must be clear and free from solid impurities. In the official processes the solution of the volatile oils is facilitated by the use of purified talc; but the solution may, if preferred, be aided by replacing the purified talc by pulped or shredded filter paper; waters may also be made by the addition of volatile oils to hot water and separation of excess of the former, or by the distillation of the drug or volatile oil with water, if by either of these methods the finished product corresponds in all respects with official requirements.

Six Methods of Preparation.

(1) Simple Solution in Cold Water.—*Agitation.*—Aqua Amygdalæ Amaræ; Chloroformi; Creosoti.

Passing Gases through Water.—Aqua Ammoniæ; Ammoniæ Fortior; Hydrogenii Dioxidi;* Liquor Chlori Compositus.†

(2) Solution in Hot Water.—Shake the oil with hot water, let stand until cold, decant and filter. Volatile oils are made more soluble in hot than in cold water.

(3) Filtration through an Absorbent Powder.—Aqua Anisi; Camphoræ; Cinnamomi; Fœniculi; Menthæ Piperitæ, and Menthæ Viridis are made by percolation through impregnated Purified Talc. In preparing Aqua Camphoræ, a little alcohol is used to aid in the trituration of the camphor.

(4) Filtration through Pulp or Shredded Filter Paper.—Permitted by U. S. P. (8th Rev.). Drop vol. oil upon white filtering paper, tear paper into shreds, transfer to flask or stoneware jar, add boiling water in portions, shake thoroughly, cool, filter, and adjust quantity by pouring distilled water through the filter.

(5) Percolation through Cotton Impregnated with the Substance.—Official in U. S. P. of 1880, abandoned because troublesome and wasteful. Drop oil on absorbent cotton, pull apart to insure thorough division, pack in funnel, percolate water through it. Place pieces of dry cotton inside of funnel to prevent drops of oil which may escape solution passing through.

(6) Distillation.—Aqua Aurantii Florum Fortior; Aurantii Florum; Hamamelidis; Rosæ Fortior; Rosæ; and Aqua Destillata.

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* Although H_2O_2 is not a gas in the usual sense of the term, the solution is classed here for sake of convenience.

† See also under Liquors. Included here as it is mainly composed of volatile substances.

Aqua Ammoniæ. Contains 10 per cent. ammonia gas by weight. Externally stimulant, irritant or caustic. Internally antacid and stimulant. Average dose, 1 Cc. (15 ♏). Should be largely diluted when taken internally. Useful in heartburn, sick headache, syncope. Slowly injected into a vein, a powerful stimulant to heart and respiration.

Aqua Ammoniæ Fortior (Stronger Ammonia Water). Contains 28 per cent. gas by weight. Used for making Aqua Ammonia, or properly diluted (4 or 5 to 8) as a rubefacient, vesicatory, or escharotic. Apply on cotton confined in top of a pill box.

Aqua Amygdalæ Amaræ. (0.1 per cent.) Useful vehicle. Average dose, 4 Cc. (1 fl. dr.).

Aqua Anisi. (0.2 per cent. oil.) Useful vehicle. Average dose, 16 Cc. (4 fl. dr.).

Aqua Aurantii Florum. Prepared by diluting the stronger water with equal volumes distilled water, and is also used as a vehicle. Average dose, 16 Cc. (4 fl. dr.).

Aqua Aurantii Florum Fortior (Triple Orange Flower Water). Water saturated with the volatile oil of Fresh Orange Flowers, obtained as a by-product in the distillation of the Oil of Orange Flowers. Vehicle. Average dose, 8 Cc. (2 fl. dr.).

Aqua Camphoræ. Camphor 0.8 dissolved in Alcohol and afterward triturated with Purified Talc. Vehicle. Average dose, 8 Cc. (2 fl. dr.).

Aqua Chloroformi. A saturated solution with excess of Chloroform present. Antiseptic vehicle. Average dose, 16 Cc. (4 fl. dr.).

Aqua Cinnamomi. (0.2 per cent.) Vehicle. Use cautiously in inflammatory affections. Average dose, 16 Cc. (4 fl. dr.).

Aqua Creosoti. 1 per cent. Creosote. Antiseptic. Stimulant externally. Local nerve paralyzant. Average dose, 8 Cc. (2 fl. dr.).

Aqua Destillata. 800 parts from 1000 of Water. Used for preparing the official diluted acids, for absorbing gaseous ammonia, for preparing nearly all the official aqueous solutions, and for compounding prescriptions.

Aqua Fœniculi. (0.2 per cent.) Vehicle. Average dose, 16 Cc. (4 fl. dr.).

Aqua Hamamelidis. (So-called Distilled Extract of Witch Hazel, or Pond's Extract.) Average dose, 8 Cc. (2 fl. dr.).

Aqua Hydrogenii Dioxidi (Solution of Hydrogen Peroxide). 3 per cent. by weight of pure Hydrogen Dioxide. Oxidizer, deodorant, disinfectant. Coagulates the albumin of tissues. Also used in the arts for bleaching purposes. Average dose, 4 Cc. (1 fl. dr.).

Aqua Menthæ Piperitæ, and **Aqua Menthæ Viridis.** (0.2 per cent.) Are useful vehicles. Average dose, 16 Cc. (4 fl. dr.).

Aqua Rosæ (Rose Water). Prepared by mixing equal volumes of Triple Rose Water and Distilled Water. Vehicle. Average dose, 16 Cc. (4 fl. dr.).

Aqua Rosæ Fortior (Triple Rose Water). Water saturated with the volatile oil of rose petals, obtained as a by-product in the distillation of oil of rose. Average dose, 8 Cc. (2 fl. dr.).

LIQUORES—SOLUTIONS.

LIQUOR.—An aqueous solution of a chemical substance. Liquors are divided into two classes, according to the method of preparation,—viz., *simple solutions* and *chemical solutions*.

SIMPLE SOLUTIONS.

Liquor Acidi Arsenosi. Should contain Arsenious Acid, corresponding in amount to 1 per cent. of Arsenic Trioxide. Medical properties same as Fowler's Solution. Average dose, 0.2 Cc. (3 ♏).

Liquor Antisepticus. (Similar to Listerine, etc.) Boric Acid, 20 Gm.; Benzoic Acid, 1 Gm.; Thymol, 1 Gm.; Eucalyptæ, 0.25 Cc.; Oil of Peppermint, 0.50 Cc.; Oil of Gaultheria, 0.25 Cc.; Oil of Thyme, 0.10 Cc.; Alcohol, 250 Cc.; Water, 20 Cc. to make 1000 Cc. Average dose, 4 Cc. (1 fl. dr.).

Liquor Arseni et Hydrargyri Iodidi (Solution of Arsenic and Mercuric Iodide) (Donovan's Solution). Contains 1 per cent. of each of the active ingredients. Alterative. Average dose, 0.1 Cc. (1½ ♏).

Liquor Calcis (Solution of Calcium Hydrate, Lime Water). A saturated solution. Antacid, tonic and astringent. Average dose, 16 Cc. (4 fl. dr.).

Liquor Iodi Compositus (Lugol's Solution). Should contain not less than 5 per cent. Iodine, 10 per cent. Potassium Iodide. Average dose, 0.2 Cc. (3 ♏).

Liquor Plumbi Subacetatis Dilutus (Lead Water). Contains 4 per cent. of the stronger lead water. Astringent and sedative externally.

Liquor Potassii Hydroxidi. (Liquor Potassæ, U. S. P., 1880.) An aqueous solution containing about 5 per cent. of Potassium Hydroxide. Average dose, 1 Cc. (15 ♏).

Liquor Sodii Hydroxidi. (Liquor Sodæ, U. S. P., 1890.) An aqueous solution containing about 5 per cent. of Sodium Hydroxide. Average dose, 1 Cc. (15 ♏).

Liquor Sodii Arsenatis. Should contain Sodium Arsenate corresponding in amount to not less than 1 per cent. of Exsiccated Sodium Arsenate. Average dose, 0.2 Cc. (3 ♏).

CHEMICAL SOLUTIONS.

Liquor Ammonii Acetatis (Spirit of Mindererus). An aqueous solution which should contain not less than 7 per cent. of Ammonium Acetate, together with small amounts of acetic and carbonic acids. Made by dissolving 5 Gm. of the Carbonate in 100 Cc. diluted Acetic Acid. Diaphoretic in fevers. Average dose, 16 Cc. (4 fl. dr.).

Liquor Chlori Compositus.—Compound Solution of Chlorine. Chlorine Water. (To replace Aqua Chlori, U. S. P., 1890.) An aqueous solution containing, when freshly prepared, about 0.4 per cent. of Chlorine with some Oxide of Chlorine and Potassium Chloride. Average dose, 4 Cc. (1 fl. dr.).

Liquor Cresolis Compositus.—(Similar to Lysol.) Cresol, 500 Gm.; Linseed Oil, 350 Gm.; Potassium Hydroxide, 8 Gm.; Water to 1000 Gm.

Liquor Ferri Chloridi. An aqueous solution of Ferric Chloride which should contain not less than 29 per cent. of the anhydrous salt, corresponding to 10 per cent. of metallic iron. Average dose, 0.1 Cc. (1½ ♏). Used in preparing Tincture of Ferric Chloride; also externally as a styptic to arrest hemorrhage.

Liquor Ferri et Ammonii Acetatis (Basham's Mixture). Contains in each thousand Cc. Tr. Ferri. Chlor. 40 Cc., Acid Acetic Dil. 60 Cc., Sol. Ammon. Acet. 500 Cc., Aromat. Elix. 120 Cc., Glycerin 120 Cc., Water to 100 Cc. To the Sol. Ammon. Acet. (which should not be alkaline) add, successively, the Acid, Tr., Elixir, and Glycerin, and then enough Water to make 1000 Cc. Actively chalybeate, also astringent, and very largely used in Bright's disease. Average dose, 16 Cc. (4 fl. dr.).

Liquor Ferri Subsulphatis (Solution of Basic Ferric Sulphate, Monsel's Solution). An aqueous solution of variable chemical composition, containing an amount of basic ferric sulphate corresponding to not less than 13.57 per cent. of metallic iron. Styptic to bleeding surfaces; used internally in hemorrhage of stomach and bowels. Average dose, 0.2 Cc. (3 ♏).

Liquor Ferri Tersulphatis. An aqueous solution which should contain about 35 per cent. of normal Ferric Sulphate, corresponding to not less than 10 per cent. of metallic Iron. Used for preparing other Iron preparations, as in the preparation of the antidote for Arsenic.

Liquor Formaldehydi (Formalin). An aqueous solution, containing not less than 37 per cent. by weight of absolute Formaldehyde ($H.COH = 29.79$), an oxidation product of methyl alcohol.

Liquor Hydrargyri Nitratis. A liquid which should contain about 60 per cent. of Mercuric Nitrate, and about 11 per cent. of free HNO_3. Caustic application to chancre, etc.

Liquor Magnesii Citratis. Made by dissolving 33 Gm. Citric Acid in 120 Cc. of Water and adding 15 Gm. Magnesium Carbonate; dissolving; filtering into a bottle holding 360 Cc. (containing 120 Cc. Syrup of Citric Acid), adding enough Water to nearly fill the bottle, dropping in 2.5 Gm. Potassium Bicarbonate; shaking until dissolved; corking, and securing the cork with twine. Average dose, 360 Cc. (12 fl. dr.).

Liquor Plumbi Subacetatis. (Sometimes called Goulard's Extract.) An aqueous liquid, containing not less than 25 per cent. of Lead Subacetate. Used externally as a sedative in sprains, etc., when dilute, from ½ or 1 part to 16 parts distilled water.

Liquor Potassii Arsenitis (Fowler's Solution). A scientific substitute for *Tasteless Ague Drop*. An aqueous solution which should contain Potassium Arsenate corresponding in amount to 1 per cent. of Arsenic trioxide, formed by the combination of Arsenous acid with Potassium of the Potassium Bicarbonate (Carbon Dioxide being evolved). Compound Spirit of Lavender is added to give it taste, and prevent its being mistaken for water; 100 ♏ equal about 1 gr. Arsenic. Average dose, 0.2 Cc. (3 ♏).

Liquor Potassæ Citratis (Mistura Potassii Citratis). An aqueous liquid, containing in solution not less than 8 per cent. of anhydrous Potassium Citrate, together with small amounts of citric and carbonic acids. Made by dissolving separately Potass. Bicarb. and Citric Acid, and afterward mixing the solution under the names *neutral mixture*, *saline mixture*, or *effervescing draught;* long used as a refrigerant diaphoretic. Average dose, 16 Cc. (4 fl. dr.).

Liquor Sodæ Chlorinatæ (Labarraque's Solution). An aqueous solution of several Chlorine compounds of Sodium, containing at least 2.4 per cent. by weight of available Chlorine. Stimulant, antiseptic, and resolvent. Average dose, 1 Cc. (15 ♏). Also, use locally for fetor, etc. A powerful disinfectant.

Liquor Sodii Phosphatis Compositus. Sodium Phosphate, 1000 Gm.; Sodium Nitrate, 40 Gm.; Citric Acid, 130 Gm.; Dist. Water, to 1000 Cc. Average dose, 8 Cc. (2 fl. dr.).

Liquor Zinci Chloridi. An aqueous solution containing about 50 per cent. by weight of Zinc Chloride. A substitute for Burnett's Disinfecting Fluid. Used locally to disinfect fetid discharges; also employed for preserving anatomical specimens.

For additional information regarding liquores see under the head of the bases entering into them (Part III).

AQUEOUS SOLUTIONS CONTAINING SWEET OR VISCID SUBSTANCES.

SYRUPI—SYRUPS.

Syrup: A dense saccharine solution, generally medicated or flavored.

Sugar: Sugar is in white, dry, hard, distinctly crystalline granules, permanent in the air, odorless, having a purely sweet taste, and a neutral reaction. Commercially known as "granulated sugar." *Simple Syrup:* When water alone is used in making the solution of sugar. *Medicated Syrups:* When the water contains soluble principles from various medicinal substances.

There are twenty-nine official Syrups, which may be classed, according to method of preparation, as tabulated on pages 40 and 41.

MELLITA—HONEYS.

Mellita, or **Honeys:** Thick liquid preparations closely allied to syrups, differing merely in the use of honey as a base instead of syrup.

There are three official honeys:—

1. **Mel:** Commercial Honey. A saccharine secretion deposited in the honeycomb by Apis Mellifica. 2. **Mel Depuratum;** Clarified Honey. Commercial honey clarified by heating and straining. 3. **Mel Rosæ**—120 Gm. Fldext. Rose; Clar. Honey to 1000 Gm.

MUCILAGINES—MUCILAGES.

Mucilagines, or **Mucilages:** Thick, viscid, adhesive liquids, produced by dissolving gum in water, or by extracting with water the mucilaginous principles from vegetable substances.

1. WITHOUT HEAT.—(2) **Mucilago Acaciæ**—340 Gm.; Acacia, 330 Gm.; Lime-water to 1000 Gm. **Sassafras Medullæ**—2 Gm. Sas. Pith.; Water to 100 Cc.

2 WITH HEAT.—(2) **Mucilago Tragacanthæ**—6 Gm.; 18 Gm. Glycerin; Water to 100 Gm. **Ulmi**—6 Gm.; Water to 100 Cc. Average dose of the above mucilages, 16 Cc. (4 fl. dr.).

EMULSA—EMULSIONS.

Emulsion: A soft, liquid preparation resembling milk, and consisting of an oily or resinous substance suspended in water by means of gum, yolk of egg, or other viscid matter.

Emulsions may be divided into three classes: Natural Emulsions, Gum-Resin and Seed Emulsions, and Oil or Artificial Emulsions.

1. NATURAL EMULSIONS.—Those that exist ready formed in nature. Examples: milk, egg yolk, various plant juices, etc.

The emulsions that result when asafetida, ammoniac, myrrh, etc., are triturated with water belong to this class. The resinous and oily substances present are suspended in the water by the gummy matter present.

2. MANUFACTURED EMULSIONS.—Two general methods for their preparation:—

1. *Continental Method.* Make a *nucleus* by triturating together oil, 2 parts; powdered (*granulated*) acacia, 1 part; water 1½ parts *by weight.* When the oil is easy to emulsify the amount of acacia to oil may be reduced to 1–4. Directions: (1) Stir the oil with the gum in a dry mortar. Add the water immediately, all at once, and stir rapidly until a thick, creamy emulsion results, which is then diluted as desired; or (2) triturate the acacia with the water, add the oil at once, triturate to make nucleus; or (3) shake the oil and water together in a flask, and pour the mixture over the gum previously placed in a mortar, and triturate rapidly.

2. *English Method.* Make a thick mucilage of gum and water in a mortar, and to it add gradually and alternately the oil and water until the emulsion is completed.

Other emulsifying agents than acacia may be employed, such as tragacanth, yolk of egg, Irish moss, quillaja bark, extract of malt, casein, pancreatin, and gelatin. There are six official emulsions:—

Emulsum Amygdalæ (Emulsion of Almond) [Mistura Amygdalæ, U. S., 1880. Milk of Almond]. Sweet Almond, 60 Gm.; Acacia, 10 Gm.; Sugar, 30 Gm.; Water, q. s. to make 1000 Cc. Demulcent. Average dose, 120 Cc. (4 fl. oz.).

Emulsum Asafœtida (Emulsion of Asafetida). Asafetida, 40 Gm.; Water to 1000 Cc. Antispasmodic. Average dose, 16 Cc. (4 fl. dr.).

Emulsum Chloroformi (Emulsion of Chloroform) [Mistura Chloroformi, U. S. P., 1880]. Chloroform, 40 Cc.; Exp. Ol. Almond, 60 Cc.; Tragacanth, powd., 10 Gm.; Water, q. s. to make 1000 Cc. Anodyne. Average dose, 8 Cc. (4 fl. dr.).

Emulsum Olei Morrhuæ (Emulsion of Cod Liver Oil). Cod Liver Oil, 500 Cc.; Acacia, 125 Gm.; Syrup, 100 Cc.; Ol. Gaultheriæ, 4 Cc.; Water, to make 1000 Cc. Average dose, 8 Cc. (4 fl. dr.).

Emulsum Olei Morrhuæ cum Hypophosphitibus (Emulsion of Cod Liver Oil with Hypophosphites). Cod Liver Oil, 500 Cc.; Acacia, 125 Gm.; Calc. Hypophos., 10 Gm.; Potass. Hypophos., 5 Gm.; Sodium Hypo-

SYRUPS CLASSIFIED ACCORDING TO METHODS OF PREPARATION.

Title and Method of Preparation.	*Subclasses*	*Constituents.*	*Properties and Dose.*
SIMPLE ADDITION OF MEDICATING LIQUID TO SYRUP.			
Syrupus Acidi Hydrodici, .	Simple Admixture.	(1 per cent. HI) 100 Gm. Dil. HI, 300 Gm. W., 600 Gm. Syr.	Alterative, 4 Cc. (1 fl. dr.).
Amygdalæ,......	" "	10 Cc. Sp. Bitter A., 100 Cc. O. Fl. W., Syr. to 1000 Cc.	Vehicle.
Ferri Quininæ et Strychninæ Phosphatum, ..	" "	250 Cc. Gly. Phos. I. Q. and S. Syr. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Acidi Citrici, ...	From Tr. and Cit. Acid.	10 Gm. Cit. Ac., 10 Gm. Dist. W., 10 Cc. Tr. Fr. Lem. Peel, Syr. to 1000 Cc.	Vehicle.
Lactucarii, ...	From Tincture.	100 Cc. Tr. Lac., 1 Gm. Cit. Ac., 50 Cc. O. Fl. W., 200 Cc. Gly., Syr. to 1000 Cc.	Vehicle, Sedative, 8 Cc. (2 fl. dr.).
Rhei Aromaticus,	From Ar. Tr.	150 Cc. Arom. Tr. of R., 1 Gm. Potass. Carb., 850 Cc. Syr.	Purgative, 8 Cc. (2 fl. dr.).
Krameriæ, ...	From Fldext.	450 Cc. Flex. K., 550 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Rhei, ...	" "	100 Cc. Flex. R., 4 Cc. Sp. Cin., 10 Gm. Potass. Carb., 50 Cc. W., Syr. to 1000 Cc.	Laxative, 8 Cc. (2 fl. dr.).
Rubi,...........	" "	250 Cc. Flext. Rubus, 750 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Senegæ,.........	" "	200 Cc. Fldext. Senega, 800 Cc. Syrup.	Expectorant, 4 Cc. (1 fl. dr.).
Sennæ,..........	" "	250 Cc. Fldext. Senna, 5 Cc. Ol. Cor., Syr. to 1000 Cc.	Cathartic, 4 Cc. (1 fl. dr.).
AGITATION OF SUGAR WITH MEDICATING LIQUID WITHOUT HEAT.			
Syrupus Aurantii Florum,	Simple Solution.	850 Gm. Sugar, O. Fl. W. to 1000 Cc.	Vehicle.
Hypophosphitum,	Simple Sol. or Admixture.	45 Gm. Cal. Hypo., 15 Gm. Potass. Hypo., 15 Gm. Sod. Hypo., 2 Gm. Dil. Hypo's Acid, 650 Gm. Sug., 5 Cc. Tr. Fr. L. Peel, W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Hypophosphitum Compositus, ..	" "	35 Gm. Calc. Hypo., 17.5 Gm. Potass. Hypo., 17.5 Gm. Sod. Hypo., 2.25 Gm. Ferric Hypo., 2.25 Mn. Hypo., 1.10 Gm. Quinine, 0.115 Strych., 3.75 Gm. Sod. Cit., 15 Cc. Dil. Hypo's Acid, 775 Gm. Sug., W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).

Pruni Virginianæ,	From cold aqueous infusion.	150 Gm. W. Cherry, 700 Gm. Sug., 150 Cc. Glyc., W. to 1000 Cc.	Sedative, Vehicle, 4 Cc. (1 fl. dr.).
Calcii Lactophosphatis, ...	Sol. involv. chem. reaction.	60 Cc. Lac. Ac., 36 Cc. Phos'ic Ac., 50 Cc. O. Fl. W., 25 Gm. P. Ca. Carb., 725 Gm. Sug., W. to 1000 Cc.	Tonic. 8 Cc. (2 fl. dr.).
Aurantii, ...	From Tincture.	50 Cc. Tr. S. O. Peel, 5 Gm. Cit. Ac. 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle.
Ipecacuanhæ, ...	From Fldext.	70 Cc. Fldext. Ip., 10 Cc. Acet. Ac., 100 Cc. Glyc., 700 Gm. Sug., W. to 1000 Cc.	Expt., 1 Cc. (15 ♏). Emet., 15 Cc. (4 fl. dr.).
Rosæ, ...	" "	125 Cc. Fldext. Rose, 10 Cc. Dil. H_2SO_4, 750 Gm. Sug., W. to 1000 Cc.	Vehicle.
Scillæ Compositus,	From Fldexts.	80 Cc. Fldext. Squill, 80 Cc. Fldext. Senega, 2 Gm. A. et P. Tart., 20 Gm. Pur. Talc., 750 Gm. Sug., W. to 1000 Cc.	Exp., Diaph.. 2 Cc. (30 ♏).
SOLUTION WITH HEAT.			
Syrupus (Syr. Simplex) ..	Simple Solution.	850 Gm. Sugar, Dist. W. to 1000 Cc.	Base and Vehicle.
Acaciæ, ...	S. Sol. and Filt.	100 Gm. Acacia, 800 Gm. Sug., Dist. W. to 1000 Cc.	Vehicle.
Calcis, ...	" "	65 Gm. Lime, 350 Gm. Sug., W. to 1000 Cc.	Antacid, 2 Cc. (30 ♏).
Picis Liquidæ, ...	Mac. and Filt.	5 Gm. Tar, 10 Gm. Mg. Carb., 850 Gm. Sug. Alc., W. to 1000 Cc.	Expectorant, 4 Cc. (1 fl. dr.).
Scillæ, ...	Cont. Acetic Acid.	450 Cc. V. of S., 800 Gm. Sug., W. to 1000 Cc.	Expt., Diaph., 2 Cc. (30 ♏).
Ferri Iodidi, ...	Sol. inv. chem. ac. Pres. by Sug.	(5 per cent. Ferrous Iodide), 12.5 Gm. Iron Wire, 41.5 Gm. I., 20 Cc. Dil. Hypo's Ac., 600 Gm. Sug., W. to 1000 Cc.	Alterative, 1 Cc. (15 ♏).
Tolutanus, ...	From Tincture.	50 Cc. Tr. Tolu., 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle, 16 Cc. (4 fl. dr.).
Sarsaparillæ Compositus	From Fldext.	200 Cc. Fldext. Sar., 15 Cc., Fldext. Glycyr., 15 Cc. Fldext. Senna, 650 Gm. Sug., 0.2 Cc. Ol. Sas., 0.2 Cc. Ol. Anise, 0.2 Cc. Ol. Gaulth., W. to 1000 Cc.	Alterative, 16 Cc. (4 fl. dr.).
Zingiberis, ...	" "	30 Cc. Fldext. Ginger, 10 Mg. Carb., 820 Gm. Sug. Alc., W. to 1000 Cc.	Vehicle 16 Cc. (4 fl. dr.).

SYRUPS CLASSIFIED ACCORDING TO METHODS OF PREPARATION.

Title and Method of Preparation.	*Subclasses*	*Constituents.*	*Properties and Dose.*
SIMPLE ADDITION OF MEDICATING LIQUID TO SYRUP.			
Syrupus Acidi Hydrodici, .	Simple Admixture.	(1 per cent. HI) 100 Gm. Dil. HI, 300 Gm. W., 600 Gm. Syr.	Alterative, 4 Cc. (1 fl. dr.).
Amygdalæ, ...	" "	10 Cc. Sp. Bitter A., 100 Cc. O. Fl. W., Syr. to 1000 Cc.	Vehicle.
Ferri Quininæ et Strychninæ Phosphatum, ..	" "	250 Cc. Gly. Phos. I. Q. and S. Syr. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Acidi Citrici, ...	From Tr. and Cit. Acid.	10 Gm. Cit. Ac., 10 Gm. Dist. W., 10 Cc. Tr. Fr. Lem. Peel, Syr. to 1000 Cc.	Vehicle.
Lactucarii, ...	From Tincture.	100 Cc. Tr. Lac., 1 Gm. Cit. Ac., 50 Cc. O. Fl. W., 200 Cc. Gly., Syr. to 1000 Cc.	Vehicle, Sedative, 8 Cc. (2 fl. dr.).
Rhei Aromaticus,	From Ar. Tr.	150 Cc. Arom. Tr. of R., 1 Gm. Potass. Carb., 850 Cc. Syr.	Purgative, 8 Cc. (2 fl. dr.).
Krameriæ, ...	From Fldext.	450 Cc. Flex. K., 550 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Rhei, ...	" "	100 Cc. Flex. R., 4 Cc. Sp. Cin., 10 Gm. Potass. Carb., 50 Cc. W., Syr. to 1000 Cc.	Laxative, 8 Cc. (2 fl. dr.).
Rubi, ...	" "	250 Cc. Flext. Rubus, 750 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Senegæ, ...	" "	200 Cc. Fldext. Senega, 800 Cc. Syrup.	Expectorant, 4 Cc. (1 fl. dr.).
Sennæ, ...	" "	250 Cc. Fldext. Senna, 5 Cc. Ol. Cor., Syr. to 1000 Cc.	Cathartic, 4 Cc. (1 fl. dr.).
AGITATION OF SUGAR WITH MEDICATING LIQUID WITHOUT HEAT.			
Syrupus Aurantii Florum,	Simple Solution.	850 Gm. Sugar, O. Fl. W. to 1000 Cc.	Vehicle.
Hypophosphitum,	Simple Sol. or Admixture.	45 Gm. Cal. Hypo., 15 Gm. Potass. Hypo., 15 Gm. Sod. Hypo., 2 Gm. Dil. Hypo's Acid, 650 Gm. Sug., 5 Cc. Tr. Fr. L. Peel, W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Hypophosphitum Compositus, ..	" "	35 Gm. Calc. Hypo., 17.5 Gm. Potass. Hypo., 17.5 Gm. Sod. Hypo., 2.25 Gm. Ferric Hypo., 2.25 Mn. Hypo., 1.10 Gm. Quinine, 0.115 Strych., 3.75 Gm. Sod. Cit., 15 Cc. Dil. Hypo's Acid, 775 Gm. Sug., W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).

Pruni Virginianæ,	From cold aqueous infusion.	150 Gm. W. Cherry, 700 Gm. Sug., 150 Cc. Glyc., W. to 1000 Cc.	Sedative, Vehicle, 4 Cc. (1 fl. dr.).
Calcii Lactophosphatis, ...	Sol. involv. chem. reaction.	60 Cc. Lac. Ac., 36 Cc. Phos'ic Ac., 50 Cc. O. Fl. W., 25 Gm. P. Ca. Carb., 725 Gm. Sug., W. to 1000 Cc.	Tonic. 8 Cc. (2 fl. dr.).
Aurantii, ...	From Tincture.	50 Cc. Tr. S. O. Peel, 5 Gm. Cit. Ac. 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle.
Ipecacuanhæ, ...	From Fldext.	70 Cc. Fldext. Ip., 10 Cc. Acet. Ac., 100 Cc. Glyc., 700 Gm. Sug., W. to 1000 Cc.	Expt., 1 Cc. (15 ♏). Emet., 15 Cc. (4 fl. dr.).
Rosæ, ...	" "	125 Cc. Fldext. Rose, 10 Cc. Dil. H_2SO_4, 750 Gm. Sug., W. to 1000 Cc.	Vehicle.
Scillæ Compositus,	From Fldexts.	80 Cc. Fldext. Squill, 80 Cc. Fldext. Senega, 2 Gm. A. et P. Tart., 20 Gm. Pur. Talc., 750 Gm. Sug., W. to 1000 Cc.	Exp., Diaph., 2 Cc. (30 ♏).
SOLUTION WITH HEAT.			
Syrupus (Syr. Simplex) ..	Simple Solution.	850 Gm. Sugar, Dist. W. to 1000 Cc.	Base and Vehicle.
Acaciæ, ...	S. Sol. and Filt.	100 Gm. Acacia, 800 Gm. Sug., Dist. W. to 1000 Cc.	Vehicle.
Calcis, ...	" "	65 Gm. Lime, 350 Gm. Sug., W. to 1000 Cc.	Antacid, 2 Cc. (30 ♏).
Picis Liquidæ, ...	Mac. and Filt.	5 Gm. Tar, 10 Gm. Mg. Carb., 850 Gm. Sug. Alc., W. to 1000 Cc.	Expectorant, 4 Cc. (1 fl. dr.).
Scillæ, ...	Cont. Acetic Acid.	450 Cc. V. of S., 800 Gm. Sug., W. to 1000 Cc.	Expt., Diaph., 2 Cc. (30 ♏).
Ferri Iodidi, ...	Sol. inv. chem. ac. Pres. by Sug.	(5 per cent. Ferrous Iodide), 12.5 Gm. Iron Wire, 41.5 Gm. I., 20 Cc. Dil. Hypo's Ac., 600 Gm. Sug., W. to 1000 Cc.	Alterative, 1 Cc. (15 ♏).
Tolutanus, ...	From Tincture.	50 Cc. Tr. Tolu., 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle, 16 Cc. (4 fl. dr.).
Sarsaparillæ Compositus	From Fldext.	200 Cc. Fldext. Sar., 15 Cc., Fldext. Glycyr., 15 Cc. Fldext. Senna, 650 Gm. Sug., 0.2 Cc. Ol. Sas., 0.2 Cc. Ol. Anise, 0.2 Cc. Ol. Gaulth., W. to 1000 Cc.	Alterative, 16 Cc. (4 fl. dr.).
Zingiberis, ...	" "	30 Cc. Fldext. Ginger, 10 Mg. Carb., 820 Gm. Sug. Alc., W. to 1000 Cc.	Vehicle 16 Cc. (4 fl. dr.).

phos., 5 Gm.; Syr., 100 Cc.; . Ol. Gaulth., 4 Cc.; Water to make 1000 Cc. Other appropriate flavors may be used. Average dose 8 Cc. (4 fl. dr.).

Emulsum Olei Terebinthinæ (Emulsion of Oil of Turpentine). Rect. Oil of Turpentine, 15 Cc.; Exp. Oil. of Almond, 5 Cc.; Syr., 25 Cc.; Acacia, 15 Gm.; Water, to make 100 Cc. Average dose, 4 Cc. (1 fl. dr.).

MISTURÆ—MIXTURES.

Misturæ, or Mixtures: Aqueous liquid preparations intended for internal use, which contain suspended insoluble substances. The term mixture is used rather indiscriminately.

There are four official mixtures, as follows:

Title.	*Constituents.*	*Properties and Dose.*
MISTURA.		
Cretæ (*Chalk Mixture*),	Comp. Chalk Powder, 20 Gm.; Cinnamon Water, 40 Cc.; Water, sufficient to make 100 Cc.	Antacid, 16 Cc. (4 fl. dr.).
Ferri Composita (*Griffith's Mixture*), ...	Ferrous Sulphate, 6 Gm.; Myrrh, 18 Gm.; Sugar, 18 Gm.; Potassium Carbonate, 8 Gm.; Spirits Lavender, 60 Cc.; Rose Water, sufficient to make 1000 Cc.	Tonic, 16 Cc. (4 fl. dr.).
Glycyrrhizæ Composita (*Brown Mixture*),...	Ext. Liquorice, pure, 30 Cc.; Syrup, 50 Cc.; Acacia, 30 Gm.; Camphorated Tr. Opium, 120 Cc.; Wine of Antimony, 60 Cc.; Spirits of Nitrous Ether, 30 Cc.; Water, sufficient to make 1000 Cc.	Expectorant, 8 Cc. (2 fl. dr.). Child 4 Cc. (1 fl. dr.).
Rhei et Sodæ, ...	Sodium Bicarbonate, 35 Gm.; Fld. Ext. Rhubarb, 15 Cc.; Fld. Ext. Ipecac, 3 Cc.; Glycerin, 350 Cc.; Spirit of Peppermint, 35 Cc.; Water, sufficient to make 1000 Cc.	Carminative. Dose 4 Cc. (1 fl. dr.).

GLYCERITA—GLYCERITES.

Glyceritæ, or Glycerites: Mixtures or solutions of medicinal substances in glycerin.

There are six official glycerites, as follows:—

Title.	*Constituents.*	*Properties and Dose.*
GLYCERITUM.		
Glyceritum Acidi Tannici. (*Glycerite of Tannic Acid*),......	Tannic Acid, 20 Gm.; Glycerin, 80 Gm.	Astringent, 2 Cc. (30 ♏).
Glyceritum Amyli. (*Glycerite of Starch*),	Starch, 10 Gm.; Glycerin, 80 Gm.; Water, 10 Cc.	Emollient, base, and Excipient.

Title.	*Constituents.*	*Properties and Dose.*
GLYCERITUM.		
Glyceritum Boroglycerini. (*Glycerite of Boroglycerin*),	Boric Acid, 310 Gm.; Glycerin, to make 1000 Gm.	Antiseptic.
Glyceritum Ferri et Quininæ et Strychninæ Phosphatum,	Fr. Phos. Sol., 80 Gm.; Quinine, 104 Gm.; Strych., 0.8 Gm.; Acid Phos., 200 Cc.; Glycer., 500 Cc.; Water to 1000 Cc.	For making Syrup, etc., 1 Cc. (15 ♏).
Glyceritum Hydrastis. (*Glycerite of Hydrastis*),	Hydrastis, 1000 Gm.; Glycerin, 500 Cc.; Alcohol and Water, to make 1000 Cc.	2 Cc. (30 ♏).
Glyceritum Phenolis (Glycerite Acidi Carbolici, Pharm., 1890),	Liquefied Phenol, 20 Cc.; Glycerin, 80 Cc.	0.3 Cc. (5 ♏).

ALCOHOLIC SOLUTIONS.

SPIRITUS—SPIRITS.

Spiritus, or Spirits: Alcoholic solutions of volatile substances. They may be classified according to the method of preparation, as follows: 1. Simple Solution. 2. Solution with maceration. 3. Gaseous Solution. 4. Chemical Reaction. 5. Distillation.

There are twenty official spirits. Those made from volatile oils are frequently called *essences.*

1. SPIRITS PREPARED BY SIMPLE SOLUTION.

Title.	*Constituents.*	*Properties and Dose.*
SPIRITUS.		
Ætheris,	325 Cc. Ether; 675 Cc. Alc.	Stimulant, 4 Cc. (1 fl. dr.).
Ætheris Compositus (*Hoffmann's Anodyne*),	325 Cc. Ether; 650 Cc. alc.; 25 Cc. Ethereal Oil.	Anodyne; Stimulant, 4 Cc. (1 fl. dr.).
Ammoniæ Aromaticus,	34 Gm. Ammonia Carb.; 90 Cc. Ammonia Water; Oils, Lemon, Lavender, Nutmeg.	Stimulant, 2 Cc. (30 ♏).
Amygdalæ Amaræ,	Oil, 1 % vol.	0.5 Cc. (8 ♏).
Anisi,	Oil, 10 % vol.	4 Cc. (1 fl. dr.).
Aurantii Compositus,	Oil, Orange, 20 % vol.; Oil, Lemon, 5 % vol.; Oil, Coriander, 2% vol.; Oil, Anise, ½% vol.	Flavor.
Camphoræ,	100 Gm. Camphor; Alc. to 1000 Cc.	Stimulant; [illegible]
Chloroformi,	60 Cc. Chloroform; 940 Cc. Alc.	[illegible]
Cinnamomi,	100 Cc. Oil; 900 Cc. Alc.	[illegible]
Gaultheriæ,	50 Cc. Oil; 950 Cc. Alc.	[illegible]
Glyceritis Nitratis,	1 Gm. $C_3H_5(O.NO_2)_3$; [illegible] Alc.	[illegible]
Juniperi,	50 Cc. Oil; 950 Cc. [illegible]	[illegible]
Juniperi Compositus,	8 Cc. Oil, Junipe[illegible] Caraway; 1 Cc. [illegible] 1400 Cc. Alc., W[illegible]	[illegible]
Lavandulæ,	50 Cc. Oil; 950 C[illegible]	[illegible]

2. SPIRITS PREPARED BY SOLUTION WITH MACERATION.

Title.	*Constituents.*	*Properties and Dose.*
SPIRITUS.		
Menthæ Piperitæ, ...	100 Cc. Oil; 10 Gm. Herb, Alcohol to 1000 Cc.	Carminative, 2 Cc. (30 ♏).
Menthæ Viridis, ...	100 Cc. Oil; 10 Gm. Herb, Alcohol to 1000 Cc.	Carminative, 2 Cc. (30 ♏).

3. SPIRITS PREPARED BY GASEOUS SOLUTION.

Title.	*Constituents.*	*Properties and Dose.*
Spiritus Ammoniæ, ...	Str. W. Ammon.; Heat, Alcohol, 10 per cent. Gas. Assay.	Stimulant, 0.3 to 2 Cc. (5 to 30 ♏).

4. SPIRITS PREPARED BY CHEMICAL REACTION.

Title.	*Constituents.*	*Properties and Dose.*
Spiritus Ætheris Nitrosi, .	About 4 per cent. Ethyl Nitrite.	Diaphoretic, diuretic. 2 Cc. (30 ♏).

5. SPIRITS PREPARED BY DISTILLATION.

Title.	*Constituents.*	*Strength and Dose.*
SPIRITUS.		
Frumenti, ...	Distillation of mash of fermented grain, and at least four years old.	37 % to 47.5 % wt. or 44 % to 55 % vol. 30 Cc. (1 fl. oz.).
Vini Gallici, ...	Distillation of fermented juice of grapes, and at least four years old.	39 % to 47 % wt., or 46 % to 55 % vol. 30 Cc. (1 fl. oz.).

ELIXIRIA—ELIXIRS.

Elixiria, or Elixirs: Elixirs are aromatic, sweetened, spirituous preparations, containing small quantities of active medicinal substances. There are three official elixirs:—

Elixir Adjuvans (Adjuvant Elixir). Fldext. Glycyr., 120 Cc.; Aromat. Elix., 880 Cc.

Elixir Aromaticum (Aromatic Elixir). Comp. Spts. Orange, 12 Cc.; Syr., 375 Cc. (Pur. Talc, 30 Gm., for filtering); Alcohol, 238 Cc.; Dist. Water, q. s. to make 1000 Cc.

Elixir Ferri, Quininæ et Strychninæ Phosphatum.—Sol. Fer. Phos., 17.5 Gm.; Quinin, 8.75 Gm.; Strychnin, 0.275 Gm.; Phos. Acid, 2 Gm.; Ammon. Carb., 9 Gm.; Alcohol, 60 Cc.; Acetic Ac 28.65 Cc.; Ammon. Water, to neutralize Distilled Water, Aromat. El q. s. to make 1000 Cc. Average dose, 4 Cc. (1 fl. dr.).

ETHEREAL SOLUTIONS.

COLLODIA—COLLODIONS.

Collodia, or Collodions: Collodions are liquid preparations intended for external use, having for the base a solution of Pyroxylin, or guncotton, in a mixture of ether and alcohol. They leave a film on evaporation, which serves as a protection or an application of a medicinal ingredient to the skin. In the following description: P. = Pyroxylin; E. = Ether; A. = Alcohol.

There are four official collodions:—

Collodium (Collodion). 40 Gm. P.; 750 Cc. E.; 250 Cc. A.; decant the clear collodion from the sediment.

Collodium Cantharidatum (Cantharidal Collodion). 60 Gm. Canth.; 85 Gm. Flex. C.; Chloroform, q. s. to exhaust Canth. Recover C. by dist., evap. the residue until it weighs 15 Gm.; dissolve this in the F. C.; let settle and decant the clear Canthar. Collod. from any sediment.

Collodium Flexile (Flexible Collodion). 920 Gm. Col.; 50 Gm. Canada Turpentine; 30 Gm. Castor Oil. To make 1000 Gm.

Collodium Stypticum (Styptic Collodion). 20 Gm. Tannic Acid; 5 Cc. A.; 25 Cc. E.; Col., q. s. ft. 100 Cc.

OLEAGINOUS SOLUTIONS, FOR EXTERNAL APPLICATION.

LINIMENTA—LINIMENTS, U. S. P.

Solutions of various substances or mixtures in oily or alcoholic liquids containing fatty oils, intended for application to the skin by rubbing. There are eight official liniments: Three with fixed oil base—ammonia, calcis and camphora; four with alcohol as the principal liquid—belladonna, chloroform, saponis, and saponis mollis; one contains oil of turpentine, viz., turpentine liniment.

Title.	*Base.*	*Constituents.*
LINIMENTUM.		
Ammoniæ (Ammonia), (*Volatile Liniment*).	Cotton Seed Oil.	Ammonia Water, 350 Cc.; Alcohol, 50 Cc.; Cotton Seed Oil, 570 Cc.; Oleic Acid, 30 Cc.
Belladonnæ (Belladonna), ...	Alcohol.	Camphor, 50 Gm.; Fldext. Belladonna, to make 1000 Cc.
Calcis (Carron Oil), ...	Linseed Oil.	Lime Water, Linseed Oil, equal parts.
Camphoræ (Camphor),	Cotton Seed Oil.	Camphor, 200 Gm.; Cotton Seed Oil, 800 Gm.
Chloroformi (Chloroform), ...	Alcohol.	Chloroform, 300 Cc.; Soap Liniment, 700 Cc.
Saponis (Soap), ...	Alcohol.	Soap (Gran.), 60 Gm.; Camphor, 45 Gm.; Oil Rosemary, 10 Cc.; Alcohol, 725 Cc.; Water to make 1000 Cc.
Saponis Mollis (Soft Soap), ...	Alcohol.	Soft Soap, 650 Gm.; Oil Lavender Flowers, 20 Cc.; Alcohol, to make 1000 Cc.
Terebinthinæ (Turpentine), ...	Oil of Turpentine.	Rosin Cerate, 650 Gm.; Oil Turpentine, 350 Gm.

OLEATA—OLEATES.

Oleata, or Oleates: The official Oleates are liquid preparations, made by dissolving metallic salts, or alkaloids, in oleic acid. They are not assumed to be definite chemical compounds.

Title.	*With Olive Oil.*
OLEATUM:	
Atropinæ, ...	Atropine, 2 Gm.; Oleic Acid, 50 Gm.; Olive Oil, to 100 Gm.
Cocainæ, ...	Cocaine, 5 " " " " " " " " " "
Veratrinæ, ..!.......	Veratrum, 2 " " " " " " " " " "
	Without Olive Oil.
Quininæ,.............	Quinine, 25 Gm.; Oleic Acid, 75 Gm. to make 100 Gm. Metallic Base.
Hydrargyri, ...	Yellow Mercuric Oxide, 25 Gm.; Oleic Acid to 100 Gm.

AQUEOUS LIQUIDS MADE BY PERCOLATION OR MACERATION.

INFUSA—INFUSIONS.

Infusa, or Infusions: Infusions are liquid preparations, made by treating vegetable substances with either hot or cold water. They are not boiled, though boiling water is often employed.

INFUSIONS—FOUR METHODS.

1. PREPARED BY MACERATION.—*General Formula, U. S. P.*—"An ordinary infusion, the strength of which is not directed by the physician, nor specified by the Pharmacopœia, shall be prepared by the following formula:—

"Take of—

THE SUBSTANCE, coarsely comminuted, fifty grammes,........................	50 Gm.
BOILING WATER, 1000 cubic centimeters,...	1000 Cc.
WATER, a sufficient quantity	
To make 1000 cubic centimeters, ...	1000 Cc.

"Put the substance into a suitable vessel provided with a cover, pour upon it the Boiling Water, cover the vessel tightly, and let it stand for half an hour. Then strain, and pass enough water through the strainer to make the infusion measure 1000 cubic centimeters.

"*Caution.*—The strength of infusions of energetic or powerful substances should be specially prescribed by the physician."

Various styles of infusion jars, pitchers, and mugs are described in Remington's "Practice of Pharmacy."

Infusion Digitalis (Infusion of Digitalis). Dig., 15 Gm.; Alcohol, 100 Cc.; Cin. Water, 150 Cc.; Boiling Water, 500 Cc.; Cold Water q. s. ft. 1000 Cc. Macerate one hour. Average dose, 8 Cc. (2 fl.

Infusum Sennæ Compositum. (Compound Infusion of (Black Draught). 60 Gm. Senna; 120 Gm. Manna; 120 G

Sulph.; 20 Gm. Fennel; Boiling W., 800 Cc.; Cold W., q. s. ft. 1000 Cc. Average dose, 120 Cc. (4 fl. oz.).

2. BY DIGESTION.—Let stand at a moderate heat below boiling. Very useful method, though it may not be directed in formula.

3. BY PERCOLATION.—Should be used whenever practicable.

Infusum Pruni Virginianæ (Infusion of Wild Cherry). 40 Gm. (No. 20 powd.) Wild Cherry; Glycerin, 50 Cc.; Water, q. s. to make 1000 Cc. Average dose, 60 Cc. (2 fl. oz.).

4. BY DILUTING FLUID EXTRACTS.—"Improper and unjustifiable, except in those few cases in which the active and desirable principles of the drug are equally soluble in alcohol and in water, or in the menstruum used for both fluidextract and infusion."

DECOCTA—DECOCTIONS.

Decocta, or Decoctions: Decoctions are liquid preparations, made by *boiling* vegetable substances with water.

For description of various decoction vessels, see Remington's "Practice of Pharmacy."

General Official Formula.—"An ordinary decoction, the strength of which is not directed by the physician, shall be prepared by the following formula:—

"Take of—

THE SUBSTANCE, coarsely comminuted, ... 50 Gm.
WATER, a sufficient quantity

To make 1000 cubic centimeters, ... 1000 Cc.

"Introduce the Substance in a suitable vessel provided with a cover, pour upon it 1000 Cc. of Cold Water, cover it well, and boil for fifteen minutes; then let it cool to about 40° C. (104° F.), express the liquid, and pass through the strainer enough cold water to make the product measure 1000 Cc.

"*Caution.*—The strength of Decoctions of energetic or powerful substances should be specially prescribed by the physician."

ALCOHOLIC LIQUIDS MADE BY PERCOLATION OR MACERATION.

TINCTURÆ—TINCTURES.

Tincture: A tincture is an alcoholic solution of a medicinal substance.

Difference between Tincture and Spirit: The latter, with one exception, are solutions of *volatile* substances in alcohol, while the former are of non-volatile substances.

Processes Used: *Percolation, maceration, solution* or *dilution.*

Menstrua Employed: Alcohol, diluted alcohol of various strengths, [illegible] tures of alcohol, water, and glycerin.

[illegible] **lution or dilution:** Tr. Iodine,

[illegible] and compound Tinctures.

SYRUPS CLASSIFIED ACCORDING TO METHODS OF PREPARATION.

Title and Method of Preparation.	*Subclasses*	*Constituents.*	*Properties and Dose.*
SIMPLE ADDITION OF MEDICATING LIQUID TO SYRUP.			
Syrupus Acidi Hydrodici, .	Simple Admixture.	(1 per cent. HI) 100 Gm. Dil. HI, 300 Gm. W., 600 Gm. Syr.	Alterative, 4 Cc. (1 fl. dr.).
Amygdalæ, ...	" "	10 Cc. Sp. Bitter A., 100 Cc. O. Fl. W., Syr. to 1000 Cc.	Vehicle.
Ferri Quininæ et Strychninæ Phosphatum, ..	" "	250 Cc. Gly. Phos. I. Q. and S. Syr. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Acidi Citrici, ...	From Tr. and Cit. Acid.	10 Gm. Cit. Ac., 10 Gm. Dist. W., 10 Cc. Tr. Fr. Lem. Peel, Syr. to 1000 Cc.	Vehicle.
Lactucarii, ...	From Tincture.	100 Cc. Tr. Lac., 1 Gm. Cit. Ac., 50 Cc. O. Fl. W., 200 Cc. Gly., Syr. to 1000 Cc.	Vehicle, Sedative, 8 Cc. (2 fl. dr.).
Rhei Aromaticus,	From Ar. Tr.	150 Cc. Arom. Tr. of R., 1 Gm. Potass. Carb., 850 Cc. Syr.	Purgative, 8 Cc. (2 fl. dr.).
Krameriæ, ...	From Fldext.	450 Cc. Flex. K., 550 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Rhei, ...	" "	100 Cc. Flex. R., 4 Cc. Sp. Cin., 10 Gm. Potass. Carb., 50 Cc. W., Syr. to 1000 Cc.	Laxative, 8 Cc. (2 fl. dr.).
Rubi, ...	" "	250 Cc. Flext. Rubus, 750 Cc. Syr.	Astringent, 4 Cc. (1 fl. dr.).
Senegæ, ...	" "	200 Cc. Fldext. Senega, 800 Cc. Syrup.	Expectorant, 4 Cc. (1 fl. dr.).
Sennæ, ...	" "	250 Cc. Fldext. Senna, 5 Cc. Ol. Cor., Syr. to 1000 Cc.	Cathartic, 4 Cc. (1 fl. dr.).
AGITATION OF SUGAR WITH MEDICATING LIQUID WITHOUT HEAT.			
Syrupus Aurantii Florum,	Simple Solution.	850 Gm. Sugar, O. Fl. W. to 1000 Cc.	Vehicle.
Hypophosphitum,	Simple Sol. or Admixture.	45 Gm. Cal. Hypo., 15 Gm. Potass. Hypo., 15 Gm. Sod. Hypo., 2 Gm. Dil. Hypo's Acid, 650 Gm. Sug., 5 Cc. Tr. Fr. L. Peel, W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).
Hypophosphitum Compositus, ..	" "	35 Gm. Calc. Hypo., 17.5 Gm. Potass. Hypo., 17.5 Gm. Sod. Hypo., 2.25 Gm. Ferric Hypo., 2.25 Mn. Hypo., 1.10 Gm. Quinine, 0.115 Strych., 3.75 Gm. Sod. Cit., 15 Cc. Dil. Hypo's Acid, 775 Gm. Sug., W. to 1000 Cc.	Tonic, 8 Cc. (2 fl. dr.).

Pruni Virginianæ,	From cold aqueous infusion.	150 Gm. W. Cherry, 700 Gm. Sug., 150 Cc. Glyc., W. to 1000 Cc.	Sedative, Vehicle, 4 Cc. (1 fl. dr.).
Calcii Lactophosphatis, ...	Sol. involv. chem. reaction.	60 Cc. Lac. Ac., 36 Cc. Phos'ic Ac., 50 Cc. O. Fl. W., 25 Gm. P. Ca. Carb., 725 Gm. Sug., W. to 1000 Cc.	Tonic. 8 Cc. (2 fl. dr.).
Aurantii, ...	From Tincture.	50 Cc. Tr. S. O. Peel, 5 Gm. Cit. Ac. 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle.
Ipecacuanhæ, ...	From Fldext.	70 Cc. Fldext. Ip., 10 Cc. Acet. Ac., 100 Cc. Glyc., 700 Gm. Sug., W. to 1000 Cc.	Expt., 1 Cc. (15 ♏). Emet., 15 Cc. (4 fl. dr.).
Rosæ, ...	" "	125 Cc. Fldext. Rose, 10 Cc. Dil. H_2SO_4, 750 Gm. Sug., W. to 1000 Cc.	Vehicle.
Scillæ Compositus,	From Fldexts.	80 Cc. Fldext. Squill, 80 Cc. Fldext. Senega, 2 Gm. A. et P. Tart., 20 Gm. Pur. Talc., 750 Gm. Sug., W. to 1000 Cc.	Exp., Diaph., 2 Cc. (30 ♏).
SOLUTION WITH HEAT.			
Syrupus (Syr. Simplex) ..	Simple Solution.	850 Gm. Sugar, Dist. W. to 1000 Cc.	Base and Vehicle.
Acaciæ, ...	S. Sol. and Filt.	100 Gm. Acacia, 800 Gm. Sug., Dist. W. to 1000 Cc.	Vehicle.
Calcis, ...	" "	65 Gm. Lime, 350 Gm. Sug., W. to 1000 Cc.	Antacid, 2 Cc. (30 ♏).
Picis Liquidæ, ...	Mac. and Filt.	5 Gm. Tar, 10 Gm. Mg. Carb., 850 Gm. Sug. Alc., W. to 1000 Cc.	Expectorant, 4 Cc. (1 fl. dr.).
Scillæ, ...	Cont. Acetic Acid.	450 Cc. V. of S., 800 Gm. Sug., W. to 1000 Cc.	Expt., Diaph., 2 Cc. (30 ♏).
Ferri Iodidi, ...	Sol. inv. chem. ac. Pres. by Sug.	(5 per cent. Ferrous Iodide), 12.5 Gm. Iron Wire, 41.5 Gm. I., 20 Cc. Dil. Hypo's Ac., 600 Gm. Sug., W. to 1000 Cc.	Alterative, 1 Cc. (15 ♏).
Tolutanus, ...	From Tincture.	50 Cc. Tr. Tolu., 10 Gm. Mg. Carb., 820 Gm. Sug., W. to 1000 Cc.	Vehicle, 16 Cc. (4 fl. dr.).
Sarsaparillæ Compositus	From Fldext.	200 Cc. Fldext. Sar., 15 Cc.. Fldext. Glycyr., 15 Cc. Fldext. Senna, 650 Gm. Sug., 0.2 Cc. Ol. Sas., 0.2 Cc. Ol. Anise, 0.2 Cc. Ol. Gaulth., W. to 1000 Cc.	Alterative, 16 Cc. (4 fl. dr.).
Zingiberis, ...	" "	30 Cc. Fldext. Ginger, 10 Mg. Carb., 820 Gm. Sug. Alc., W. to 1000 Cc.	Vehicle 16 Cc. (4 fl. dr.).

SYLLABUS OF TINCTURES.—(*Continued.*)

CLASSES: Per cent. Most Active Const.	CONSTITUENTS IN 1000 Cc.	MENSTRUUM Cc. IN 1000 Cc.	DOSE.
TINCTURA.			
Class 9 = 20 per cent.			
Krameriæ, ...	Krameria, 200 Gm.	Dil. Alcohol.	4 Cc. (1 fl. dr.).
Myrrhæ, ...	Myrrha, 200 Gm.	Alcohol.	1 Cc. (15 ♏).
Pyrethri, ...	Pyrethrum, 200 Gm.	"	
Quassiæ, ...	Quassia, 200 Gm.	A. 350, W. 650.	2 Cc. (30 ♏).
Quillajæ, ...	Quillaja, 200 Gm.	Decoction + A. 350.	
Rhei, ...	Rhubarb, 200 Gm.; Card., 40 Gm.	G. 100, A. 500, W. 400.	4 Cc. (1 fl. dr.).
Rhei Aromatica, ...	Rhub., 200 Gm.; S. Cin., 40 Gm.; Cloves, 40 Gm.; Nutmeg, 20 Gm.	G. 100, A. 500, W. 400.	2 Cc. (30 ♏).
Serpentariæ, ...	Serpentaria, 200 Gm.	A. 650, W. 350.	4 Cc. (1 fl. dr.).
Tolutana, ...	Balsam of Tolu, 200 Gm.	Alcohol.	2 Cc. (30 ♏).
Valerianæ, ...	Valerian, 200 Gm.	A. 750, W. 250.	4 Cc. (1 fl. dr.).
Valerianæ Ammoniata, ...	Valerian, 200 Gm.	Spts. Ammon. Arom.	2 Cc. (30 ♏).
Zingiberis, ...	Ginger, 200 Gm.	Alcohol.	2 Cc. (30 ♏).
Class 10 = 24 per cent.			
Benzoini Composita,	Benz., 100 Gm.; P. Aloes, 20 Gm.; Storax, 80 Gm.; B. Tolu, 40 Gm.	Alcohol.	4 Cc. (1 fl. dr.).
Class 11 = 50 per cent.			
Aurantii Dulcis, ...	Sweet Orange Peel from fresh fruit, 500 Gm.	Alcohol.	1 Cc. (15 ♏).
Lactucarii, ...	Lactucarium, 500 Gm.	G. 250, P. Benz., D. A.	2 Cc. (30 ♏).
Limonis Corticis, ...	Lemon Peel from fresh fruit, 500 Gm.	Alcohol.	
Class 12 = 50 per cent.			
Tincturæ Herbarum Recentium, ...	500 Gm.	Alcohol.	

A. = Alcohol. W. = Water. D. A. = Dilute Alcohol. G. = Glycerin. Ac. A. = Acetic Acid.

STANDARDIZED TINCTURES.

WHEN ASSAYED BY THE PROCESS GIVEN BY THE PHARMACOPŒIA.

TINCTURA:				
Aconiti	should contain in 100 Cc.	0.045	Gm.	Aconitine.
Belladonnæ Foliorum.	" " " " "	0.035	"	Alkaloids.
Cinchonæ	" " " " "	0.750	"	Anhydrous, ether-soluble alkaloids.
Colchici Seminis......	" " " " "	0.050	"	Colchicine.
Hydrastis	" " " " "	0.400	"	Hydrastine.
Hyoscyami	" " " " "	0.007	"	Mydriatic alkaloids.
Nucis Vomicæ	" " " " "	0.100	"	Strychnine.
Opii..............	" " " " "	1.2 to 1.25	Gm.	Cryst. morphin.
Opii Deodorati	" " " " "	1.2 to 1.25	"	" "
Physostigmatis........	" " " " "	0.014	Gm.	Ether-sol. alkaloids.
Stramonii	" " " " "	0.030	"	Mydriatic "

TINCTURES OF RECENT PLANTS.

Tincturæ Herbarum Recentium: "These tinctures, when not otherwise directed, are to be prepared by the following formula:—

Take of

The Fresh Herb, bruised or crushed, 500 grammes, or..	500 Gm.
Alcohol, 1000 cubic centimeters, or..................	1000 Cc.

"Macerate the Herb with the alcohol for fourteen days with occasional stirring; then strongly express the liquid and filter through paper."

VINA MEDICATA—MEDICATED WINES.

Vina Medicata, or Medicated Wines: Medicated Wines are liquid preparations containing the soluble principles of medicinal substances dissolved in Wine.

The U. S. P. does not recognize any special variety of Wine, but only the general classes of white and red.

Amount of Alcohol which Wine should contain: Not less than 7 nor more than 12 per cent. by weight (equivalent to 8.5 to 15 per cent. by volume) of absolute alcohol.

Vinum Album (White Wine). An alcoholic liquid, made by fermenting the juice of fresh grapes, the fruit of *Vitis vinifera* (Fam. Vitaceæ), freed from seeds, stems, and skins, and subjected to the usual cellar-treatment for fining and aging. A pale, amber-colored or straw-colored liquid, having a pleasant odor free from yeastiness, and a fruity, agreeable, slightly spirituous taste, without excessive sweetness or acidity. When White Wine is prescribed without further specification, it is recommended that a dry White Wine of domestic production be employed.

Vinum Rubrum (Red Wine). An alcoholic liquid, made by fermenting the juice of fresh, red-colored grapes, the fruit of *Vitus vinifera*, in presence of their skins, and subjected to the usual cellar-treatment for fining and aging. A deep red liquid, having a pleasant odor free from yeastiness, and a fruity, moderately astringent, pleasant and slightly acidulous taste, without excessive sweetness or acidity. When Red Wine is prescribed without further specification, it is recommended that a dry Red Wine of domestic production (such as Native Claret, Burgundy, etc.) be employed.

There are eight Medicated Wines official in the U. S. P., as follows:

Title.	*Active Constituents.*	*Properties.*	*Dose.*
VINUM:			
Antimonii, ...	Tartar-Emetic, 0.4 %.	Expectorant.	1 Cc. (15 ♏).
Cocæ, ...	Coca, 6.5 %.	Stimulant.	[illegible]
Colchici Seminis, ...	Colchicum Seed, 10 %.	Diuretic	[illegible]
Ergotæ, ...	Ergot, 20 %.	Emme[illegible] Pa[illegible]	[illegible]
Ferri, ...	Cit. Iron and Ammon., 4 %.	[illegible]	[illegible]
Ferri Amarum......	Cit. Iron and Quinine, 5 %.	[illegible]	[illegible]
Ipecacuanhæ, ...	Fldext. Ipecac, 10 %.	[illegible]	[illegible]
Opii, ...	Granulated Opium, 10 %.	[illegible]	[illegible]

FLUIDEXTRACTA—FLUIDEXTRACTS.

Fluidextracts: Liquid alcoholic preparations of nearly uniform and definite strength, made by percolating drugs with menstrua, and concentrating a portion of the percolate, so that in each case a cubic centimeter represents the medicinal virtue of one gramme of the drug; they are mostly concentrated tinctures.

Characteristic peculiarity of Fluidextracts: They represent the activity of the drug, *volume* for *weight*, or one *minim* of fluidextract always represents about one *grain* of the drug from which it is prepared.

Advantages over Tinctures: They are uniform, definite, and concentrated.

Advantages of Tinctures over Fluidextracts: First, In some cases the alcohol menstruum of the tincture is to be desired. Second, Tinctures may be added in small proportions to aqueous preparations, without serious precipitation.

Five Principal methods of preparing Fluidextracts now in use: 1. Percolation with partial evaporation (official). 2. Percolation with incomplete exhaustion. 3. Repercolation (Squibb). 4. Continuous Percolation. Robert W. Beck's modification of Squibb's process.

Typical Formula for an official Fluidextract: "1000 grammes of the powdered drug are moistened with a certain quantity of menstruum, packed in a suitable percolator, and enough menstruum added to saturate the powder and leave a stratum above it; the lower orifice of the percolator is closed when the liquid begins to drop, the percolator is closely covered to prevent evaporation and permit maceration for a specified time; additional menstruum is poured on, and percolation continued slowly until the drug is exhausted. Usually about 800 Cc. of the first portion of the percolate is reserved, and the remainder evaporated at a temperature not exceeding 50° C. (122° F.) to a soft extract; this is to be dissolved in the reserved portion, and enough menstruum added to make the fluidextract measure 1000 Cc."—Remington.

Why the latter portion of the percolate is reserved and evaporated to a soft extract: The evaporation of the latter portion of the percolate permits concentration of the preparation without exposing the stronger portion to heat.

What is meant by Percolation with Incomplete Exhaustion: The modification of the official process is based upon the principle that the first seventy-five per cent. of the percolate contains seventy-five per cent. of drug. Acting under this assumption, the process is stopped here, and the fluid extract declared finished, and of full strength.

What is claimed in favor of this method: Saving of alcohol, and the use of heat. It is claimed that the wastage of alcohol comes from trying to recover the remaining 25 per cent. of the activity of the drug; and the use of heat is entirely obviated.

What is urged against the method: If percolation is properly conducted, the first 75 per cent. of the percolate probably does contain 75

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*For a full description of the processes referred to, see Remington's "Practice of Pharmacy."

per cent., or more, of the desired portions of the drug. But the official process, by carrying the percolation to complete exhaustion, insures against want of care and skill in conducting the operation, as the remaining activities are secured by the continuance of the percolation and final concentration.

The official Fluidextracts may be arranged in classes according to the alcoholic strength of their menstrua, as follows:—

OFFICIAL FLUIDEXTRACTS

Arranged in Classes according to the Alcoholic Strength of their Menstrua, with Manipulative Notes.

NAME.	Number of Cc. used to Moisten.	MENSTRUUM.	Number of Cc. of Reserve.	PROCESS AND REMARKS.
Class 1.		**Alcohol.**		
Fluidextractum Aromaticum, ...	350	"	850	From Aromatic Powder.
Cannabis Indicæ, ...	300	"	900	Having moistened the powder, exhaust with the menstruum, reserve the number of Cc. directed, and distil or evaporate the remainder to a soft extract; add this to the reserved portion and sufficient menstruum to make the whole measure 1000 Cc.
Capsici,..............	500	"	900	
Cimicifugæ, ...	250	"	900	
Cubebæ, ...	200	"	900	
Gelsemii,............	300	"	900	
Lupulini,............	..	"	900	
Sabinæ,..............	250	"	900	
Veratri, ...	300	"	900	
Zingiberis,..........	250	"	900	
Class 2.		**Alcohol, 4.** **Water, 1.**		
Fluidextractum Belladonnæ Radicis, ...	350	" "	800	Assayed, special process.
Eriodictyi, ...	400	" "	900	
Euonymi, ...	350	" "	800	
Mezerei, ...	400	" "	900	
Podophylli,..........	300	" "	850	
Rhei, ...	400	" "	750	
Scopolæ, ...	350	" "	800	Assayed, special process.
Serpentariæ,..........	300	" "	900	
Staphisagriæ, ...	300	" "	800	
Class 3.		**Alcohol, 3.** **Water, 1.**		
Fluidextractum Aconiti,.	400	" "	800	Assayed, special process.
Buchu, ...	400	" "	850	
Calami, ...	350	" "		
Eucalypti,............	400	" "		
Grindeliæ, ...	300	"		
Ipecacuanhæ,........	350	"		
Leptandræ,..........	400			

OFFICIAL FLUIDEXTRACTS.—(*Continued.*)

NAME.	Number of Cc. used to Moisten.	MENSTRUUM.	Number of Cc. of Reserve.	PROCESS AND REMARKS.
Class 3.		**Alcohol, 3.** **Water, 1.**		
Matico,	300	" "	850	
Nucis Vomicæ,	1000	" "	900	With 5 per cent. of Acetic Acid added to the menstruum to fix alkaloids. Assayed, special process.
Sumbul,	400	" "	850	
Valerianæ,	300	" "	850	
Xanthoxyli,	250	" "	900	
Class 4.		**Alcohol, 7.** **Water, 3.**		
Fluidextractum Calumbæ,	300	" "	700	
Class 5.		**Alcohol, 2.** **Water, 1.**		
Fluidextractum Aurantii Amari,	350	" "	800	
Colchici Seminis,	300	" "	750	Assayed, special process.
Hyoscyami,	400	" "	800	Assayed, special process.
Senegæ,	450	" "	850	With 3 per cent. of Solution of Potassium Hydroxide to menstruum, to dissolve pectinous bodies.
Stramonii,	400	" "	800	Assayed, special process.
Viburni Opuli,	300	" "	850	
Viburni Prunifolii,	300	" "	850	
Class 6.		**Alcohol, 65.** **Water, 35.**		
Fluidextractum Convallariæ,	400	" "	800	
Class 7.		**Diluted Alcohol.**		
Fluidextractum Berberidis,	400	" "	700	
Chimaphilæ,	400	" "	800	
Chiratæ,	350	" "	850	
Cocæ,	450	" "	700	Assayed, special process.
Conii,	300	" "	800	With 2 per cent. of Acetic Acid added to the menstruum to fix alkaloids. Assayed, special process.
Cypripedii,	350	" "	850	
Digitalis,	400	" "	850	
Ergotæ,	300	" "	850	With 2 per Acetic Aci the menstr alkaloid

OFFICIAL FLUIDEXTRACTS.—(*Continued.*)

NAME.	Number of Cc. used to Moisten.	MENSTRUUM.	Number of Cc. of Reserve.	PROCESS AND REMARKS.
Class 7.		**Diluted Alcohol.**		
Eupatorii,	400	" "	800	
Gentianæ,	350	" "	800	
Guaranæ,	200	" "	700	Assayed, special process.
Krameriæ,	400	" "	800	
Lappæ,	400	" "	800	
Phytolaccæ,	400	" "	800	
Pilocarpi,	350	" "	750	Assayed, special process.
Quillajæ,	400	" "	800	
Rubi,	350	" "	800	
Scutellariæ,	350	" "	800	
Sennæ,	400	" "	800	The Senna first exhausted with Alcohol, to remove resins, dried, and the process continued as usual.
Spigeliæ,	300	" "	850	
Stillingiæ,	300	" "	850	
Taraxaci,	300	" "	800	With 5 per cent. of Solution of Potassium Hydroxide to menstruum to neutralize Acids.
Class 8.		**Alcohol, 2.** **Water, 3.**		
Fluidextractum Rhamni Purshianæ,	400	" "	800	Having moistened the powder, exhaust with the menstruum, reserve the number of Cc. directed and distil or evaporate the remainder to a soft extract; add this to the reserved portion and sufficient menstruum to make the whole measure 1000 Cc.
Class 9.		**Alcohol, 5.** **Water, 8.**		
Fluidextractum Frangulæ,	350	" "	800	
Class 10.		**Alcohol, 1.** **Water, 2.**		
Fluidextractum Quassiæ,	400	" "	900	
Sarsaparillæ,	400	" "	800	
Class 11.		**Containing Glycerin.**		
Fluidextractum Cinchonæ,	350	Glycerin, 10. Alcohol, 80. Water, 10.	700	Finish percolation with Alcohol, 4; Water, 1. Assayed, special process.
Apocyni,	400	Glycerin, 10. Alcohol, 60. Water, 30.	900	Finish percolation with Alcohol, 3; Water, 2.
Geranii,	350	Glycerin, 10. Alcohol, 60. Water, 30.	800	
		Glycerin, 10. Alcohol, 60. [illegible]er, 30.	750	Finish percolation with Alcohol, 2; Water, 1. Assayed, special process.

OLEATA—OLEATES.

Oleata, or Oleates: The official Oleates are liquid preparations, made by dissolving metallic salts, or alkaloids, in oleic acid. They are not assumed to be definite chemical compounds.

Title.	*With Olive Oil.*
OLEATUM:	
Atropinæ,	Atropine, 2 Gm.; Oleic Acid, 50 Gm.; Olive Oil, to 100 Gm.
Cocainæ,	Cocaine, 5 “ “ “ “ “ “ “ “ “ “
Veratrinæ,	Veratrum, 2 “ “ “ “ “ “ “ “ “ “
	Without Olive Oil.
Quininæ,	Quinine, 25 Gm.; Oleic Acid, 75 Gm. to make 100 Gm. Metallic Base.
Hydrargyri,	Yellow Mercuric Oxide, 25 Gm.; Oleic Acid to 100 Gm.

AQUEOUS LIQUIDS MADE BY PERCOLATION OR MACERATION.

INFUSA—INFUSIONS.

Infusa, or Infusions: Infusions are liquid preparations, made by treating vegetable substances with either hot or cold water. They are not boiled, though boiling water is often employed.

INFUSIONS—FOUR METHODS.

1. PREPARED BY MACERATION.—*General Formula, U. S. P.*—"An ordinary infusion, the strength of which is not directed by the physician, nor specified by the Pharmacopœia, shall be prepared by the following formula:—

"Take of—

THE SUBSTANCE, coarsely comminuted, fifty grammes,	50 Gm.
BOILING WATER, 1000 cubic centimeters,	1000 Cc.
WATER, a sufficient quantity	
To make 1000 cubic centimeters,	1000 Cc.

"Put the substance into a suitable vessel provided with a cover, pour upon it the Boiling Water, cover the vessel tightly, and let it stand for half an hour. Then strain, and pass enough water through the strainer to make the infusion measure 1000 cubic centimeters.

"*Caution.*—The strength of infusions of energetic or powerful substances should be specially prescribed by the physician."

Various styles of infusion jars, pitchers, and mugs are described in Remington's "Practice of Pharmacy."

Infusion Digitalis (Infusion of Digitalis). Dig., 15 Gm.; Alcohol, 100 Cc.; Cin. Water, 150 Cc.; Boiling Water, 500 Cc.; Cold Water, q. s. ft. 1000 Cc. Macerate one hour. Average dose, 8 Cc. (2 fl. dr.).

Infusum Sennæ Compositum. (Compound Infusion of Senna) (Black Draught). 60 Gm. Senna; 120 Gm. Manna; 120 Gm. Mag.

OFFICIAL FLUIDEXTRACTS.—(*Continued.*)

NAME.	Number of Cc. used to Moisten.	MENSTRUUM.	Number of Cc. of Reserve.	PROCESS AND REMARKS.
Class 13.		**Boiling Water.**		
Tritici, ...		" "		Percolate the triticum with Boiling Water until exhausted, evaporate to 750 Cc., add 250 Cc. of Alcohol, filter, and add enough of a mixture of 1 volume of Alcohol with 3 volumes of Water to make the whole measure 1000 Cc.

FLUIDEXTRACTS CLASSIFIED ACCORDING TO DOSE.

0.05 Cc. (1 minim).

Aconite.
Belladonna Root.
Cannabis, Indian.
Capsicum.
Digitalis.
Gelsemium.
Ipecac (expectorant).
Nux Vomica.
Scopola.
Staphisagria.
Stramonium.

0.1 Cc. (1½ minims).

Phytolacca (alterative).
Sanguinaria.
Squill.
Veratrum.

0.2 Cc. (3 minims).

Conium.
Quillaja.

0.3 Cc. (5 minims).

Savin.

0.5 Cc. (8 minims).

Convallaria.
Euonymus.
Lobelia.
Lupulin.
Podophyllum.
Quassia.

1 Cc. (15 minims).

Apocynum.
Aromatic.
Calamus.
Chirata.
Cimicifuga.
Cinchona.
Cubebs.
Cypripedium.
Eriodictyon.
Frangula.
Gentian.
Ipecac (emetic).
Krameria.
Leptandra.
Phytolacca (emetic).
Quercus.
Rhamnus Purshiana. { Cascara Sagrada.
Rhamnus Pur. Aromatic. { Cascara Sagrada Aromat.
Rhubarb.
Rhus Glabra.
Rubus.
Scutellaria.
Senega.
Serpentaria.
Zingiber.

2 Cc. (30 minims).

Berberis.
Buchu.
Calumba.
Chimaphila.
Coca.
Colchicum.
Ergot.
Eucalyptus.
Glycyrrhiza.
Granatum.
Grindelia.
Guarana.
Hamamelis.
Hydrastis.
Hyoscyamus.
Lappa.
Pilocarpus.
Prunus Virginiana.
Rose.
Sarsaparilla, Compounds.
Senna.
Stillingia.
Sumbul.
Uva Ursi.
Valerian.
Viburnum Opulus.
" Prunifolium.
Xanthoxylum.

4 Cc. (1 fluidrachm).

Matico.
Spigelia.

8 Cc. (2 fluidrachms).

Taraxacum.
Triticum.

For External Use.

Mezereum.

STANDARDIZED FLUIDEXTRACTS.

The Pharmacopœia directs that the following Fluidextracts shall be standarized by process of assay given:

FLUIDEXTRACTUM:					
Aconiti,	100 Cc.	= 0.40	Gm.	of	Aconitine.
Belladonnæ Radicis,	100 "	= 0.50	"	"	Mydriatic alkaloids.
Cinchonæ,	100 "	= 4.00	"	"	Anhydrous ether-soluble alkaloids.
Cocæ,	100 "	= 0.50	"	"	" " "
Colchici Seminis,	100 "	= 0.50	"	"	Colchicine.
Conii,	100 "	= 0.45	"	"	Coniine.
Guaranæ,	100 "	= 3.50	"	"	Alkaloids.
Hydrastis,	100 "	= 2.00	"	"	Hydrastine.
Hyoscyami,	100 "	= 0.075	"	"	Alkaloids.
Ipecacuanhæ,	100 "	= 1.75	"	"	"
Nucis Vomicæ,	100 "	= 1.00	"	"	Strychnine.
Pilocarpi,	100 "	= 0.40	"	"	Alkaloids.
Scopolæ,	100 "	= 0.50	"	"	Mydriatic alkaloids.
Stramonii,	100 "	= 0.35	"	"	" "

OLEORESINOUS LIQUIDS MADE BY PERCOLATION.

OLEORESINÆ—OLEORESINS.

Oleoresinæ, or Oleoresins: Official liquid preparations, consisting principally of natural oils and resins extracted from vegetable substances by percolation with acetone. They are the strongest liquid preparations of drugs produced.

General formula for their preparation: Percolate the powdered drug, in a cylindrical percolator provided with a stop-cock cover, and receptacle suitable for volatile liquids, with acetone, until exhausted, recovering the greater part of the acetone by distillation, and exposing the residue, in a capsule, to spontaneous evaporation until the remaining acetone has evaporated.

There are six official oleoresins:—

Title.	*Average Yield and Properties.*	*Dose.*
OLEORESINA.		
Aspidii,	10–15 %. Tænicide.	2 Gm. (30 gr.).
Capsici,	5 %. Stimulant, Rubefacient.	30 Mg. (½ gr.).
Cubebæ,	18–25 %. Diuretic, Expectorant.	500 Mg. (7½ gr.).
Lupulini,	50 %. Tonic, Sedative.	200 Mg. (3 gr.).
Piperis,	5 %. Stimulant.	30 Mg. (½ gr.).
Zingiberis,	6–8 %. Stimulant.	30 Mg. (½ gr.).

ACETOUS LIQUIDS MADE BY PERCOLATION.

ACETA—VINEGARS.

Aceta, or Vinegars: Medicated vinegars are solutions of the active principles of drugs in diluted acetic acid, the latter being chosen as a menstruum because acetic acid is not only a good solvent, but also possesses antiseptic properties. Their use dates from the time of Hippocrates.

Acetic Acid is also of value as a menstruum, as it produces soluble salts with the alkaloidal principles existing in plants.

Menstruum used for their preparation: The official diluted Acetic Acid.

There are two official vinegars:—

Acetum Opii (Vinegar of Opium) [Black Drop]. Opium, 10 per cent.; nutmeg, 3 per cent.; sugar, 20 per cent. Sedative. Dose 0.3 to 1 Cc. (2 to 15 ♏).

Acetum Scillæ (Vinegar of Squill). 10 per cent. Squill. Expectorant. Dose 1 to 3 Cc. (¼ to ¾ fl. dr.).

SOLIDS.

SOLID PREPARATIONS MADE BY PERCOLATION OR MACERATION.

EXTRACTA—EXTRACTS.

Extracta, or Extracts: "Extracts are solid or semi-solid preparations, produced by evaporating solutions of vegetable substances."

Rule in regard to yield: The more aqueous the menstruum, the greater is the yield of extract; the more *alcoholic* the menstruum, the smaller the yield.

Rule in regard to strength: This is not founded on amount of extract yielded by a given menstruum, but on amount of active constituents present in the finished product.

Solid extracts are prepared either—

(*a*) From the dried and powdered drug, by extraction with a solvent, or

(*b*) From the fresh, moist drug, by expression alone.

Two degrees of consistency recognized by U. S. P.—The soft, or pilular, and the hard extract. The latter admit of being reduced to powder.

There are twenty-eight official Extracts which may be classed according to menstrua employed, as follows:—

I. ALCOHOLIC EXTRACTS.

Title.	*Dose Metric.*	*Dose Eng.*
EXTRACTUM—		
Cannabis Indicæ,	10 Mg.	⅙ gr.
*Cimicifugæ,	250 Mg.	4 gr.
Physostigmatis,	8 Mg.	⅛ gr.

* Made from fluidextract.

II. HYDRO-ALCOHOLIC EXTRACTS.

Title.	*Dose Metric.*	*Dose Eng.*
Extractum—		
Belladonnæ Foliorum,	10 Mg.	⅙ gr.
Colocynthidis,	30 Mg.	½ gr.
*Digitalis,	10 Mg.	⅙ gr.
Ergotæ (with Dil. HCl and Monhyd. Sod. Carb.),	250 Mg.	4 gr.
*Euonymi,	125 Mg.	2 gr.
*Hyoscyami,	65 Mg.	1 gr.
*Leptandræ,	250 Mg.	4 gr.
Rhamni Purshianæ,	250 Mg.	4 gr.
*Rhei,	250 Mg.	4 gr.
Scopolæ,	10 Mg.	⅙ gr.
*Stramonii,	10 Mg.	⅙ gr.
*Sumbul,	250 Mg.	4 gr.
Taraxaci,	1 Gm.	15 gr.

* Made from fluidextract.

III. AQUEOUS EXTRACTS.

Title.	*Dose Metric.*	*Dose Eng*
Extractum—		
Aloes (Boiling Water),	125 Mg.	2 gr.
Colchici Cormi (with Acetic Acid),	65 Mg.	1 gr.
Gentianæ,	250 Mg.	4 gr.
†Glycyrrhizæ,	1 Gm.	15 gr.
Glycyrrhizæ Purum (with Ammonia Water and Glycerin),	1 Gm.	15 gr.
Hæmatoxyli,	1 Gm.	15 gr.
Krameriæ,	500 Mg.	8 gr.
Malti,	16 Cc.	4 fldr.
Nucis Vomicæ (with Acetic Acid),	15 Mg.	¼ gr.
Opii,	30 Mg.	½ gr.
Quassiæ,	65 Mg.	1 gr.

† The commercial extract of licorice root.

IV. COMPOUND EXTRACTS.

Title.	*Dose Metric.*	*Dose Eng.*
Extractum—		
Colocynthidis Compositum,	500 Mg.	8 gr.

STANDARDIZED EXTRACTS.

EXTRACTUM:		
Belladonnæ Foliorum,	1.4 per cent.	mydriatic alkaloids.
Colchici Cormi,	1.4 " "	colchicine.
Hyoscyami,	0.3 " "	mydriatic alkaloids.
Nucis Vomicæ,	5.0 " "	strychnine.
Opii,	20.0 " "	morphine.
Physostigmatis,	2.0 " "	ether-soluble alkaloid.
Scopolæ,	2.0 " "	mydriatic alkaloids.

The extracts of Cimicifuga, Euonymus, Leptandra, Physostigma, and Cascara Sagrada, contain glycyrrhiza (peeled, Russian).

Extracts of Pilular Consistence: Ext. belladonnæ foliorum, cannabis indicæ, colchici cormi, digitalis, ergotæ, gentianæ, glycyrrhizæ purum, hyoscyami, malti (thick honey), rhei, scopolæ, stramonii, sumbul, taraxaci.

Extracts, Solid: Ext. aloes, glycyrrhizæ, hæmatoxyli, krameriæ.

Extracts, Powdered: Cimicifugæ, colocynthidis, colocynthidis compositum, euonymi, leptandræ, nucis vomicæ, opii, physostigmatis, quassiæ. rhamni purshianæ.

RESINÆ—RESINS.

Resinæ or Resins: The official resins are solid preparations, consisting principally of the resinous principles from vegetable bodies, prepared by precipitating them from their alcoholic solution with water.

There are three official resins:—

Jalapæ (pouring a tincture into water). Dose, 125 Mg. (2 gr.).

Podophylli (pouring a tincture into water acidulated with HCl). Dose purgative, 15 Mg. ($\frac{1}{4}$ gr.); laxative, 5 Mg. ($\frac{1}{10}$ gr.).

Scammonii (pouring a tincture, made by digesting Scammony in boiling alcohol, into water). Dose 200 Mg. (3 gr.).

SOLID PREPARATIONS MADE WITHOUT PERCOLATION OR MACERATION.

PULVERES—POWDERS.

There are nine official powders:—

Title.	*Constituents.*	*Properties and Dose.*
PULVIS:		
Acetanildi Compositus (Antikamnia?).	Acetanilid, 70 Gm.; Caffein, 10 Gm.; Sodium Bicarb., 20 Gm.	Relieves pain, 500 Mg. (8 gr.).
Aromaticus.	P. Cinnamon, 35 Gm.; P. Ginger, 35 Gm.; P. Cardamon, 15 Gm.; P. Nutmeg, 15 Gm.	Aromatic, 1 Gm. (15 gr.).
Cretæ Compositus.	Prep. Chalk, 30 Gm.; Acacia, 20 Gm.; Sugar, 50 Gm.	For Chalk Mixture, 2 Gm. (30 gr.).
Effervescens Compositus (Seidlitz Powder).	Sodium Bicarb., 31 Gm.; Rochelle Salt, 93 Gm.; Tartaric Acid, 27 Gm.; Mix the Sod. Bicarb. and Roch. Salt, and divide into 12 pts. (blue papers). Divide the T. Acid into 12 pts. (white papers).	Laxative, 1 set ders.

Title.	*Constituents.*	*Property and Dose.*
PULVIS:		
Glycyrrhizæ Compositus (Licorice Powder).	P. Senna, 180 Gm.; P. Licorice, 236 Gm.; Washed Sulphur, 80 Gm.; Oil Fennel, 4 Gm.; Sugar, 500 Gm.	Laxative, 4 Gm. (60 gr.).
Ipecacuanhæ et Opii (Dover's Powder).	P. Ipecac, 10 Gm.; P. Opium, 10 Gm.; Sugar of Milk, 80 Gm. Ten grains contain a grain each of the active constituents.	Diaphoretic, 500 Mg. (8 gr.).
Jalapæ Compositus.	P. Jalap, 35 Gm.; Potass. Bitart., 65 Gm.	Cathartic, 2 Gm. (30 gr.).
Morphinæ Compositus (Tully's Powder).	Morph. Sulph., 1.5 Gm.; P. Camphor, 32 Gm.; P. Liquorice, 33 Gm.; Precip. Calc. Carb., 33.5 Gm.	Diaphoretic, 500 Mg. (8 gr.).
Rhei Compositus.	P. Rhubarb, 25 Gm.; Magnesia, 65 Gm.; P. Ginger, 10 Gm.	Laxative, Antacid, 2 Gm. (30 gr.).

TRITURATIONES—TRITURATIONS.

Triturationes, or Triturations: A class of powders first introduced into the U. S. P. of 1880, for the purpose of fixing a definite relation between the active ingredient and the diluent.

General formula for their preparation, as directed by the U. S. P.

Take of—

	Definite Formula.
The Substance, 10 grammes, ...	10 Gm.
Sugar of Milk, in moderately fine powder, 90 grammes, ...	90 Gm.
To make 100 grammes, ...	100 Gm.

Weigh the Substance and Sugar of Milk separately; then place the Substance, previously reduced, if necessary, to a moderately fine powder, in a mortar; add about an equal measure of Sugar of Milk, mix well by means of a spatula, and triturate the powders thoroughly together. Then add fresh portions of the Sugar of Milk, from time to time, until the whole is added, and continue the trituration after each addition until the Substance is intimately mixed with the Sugar of Milk, and reduced to a fine powder.

There is one official trituration:—

Trituratio Elaterina. Elaterin, 10 Gm.; Sug. Milk, 90 Gm. Dose, 30 Mg. ($\frac{1}{2}$ gr.).

MASSÆ—MASSES.

Massæ, or Masses: Pill masses are official under this name. They are kept in bulk by pharmacists.

There are two official masses:—

Massa Ferri Carbonatis. 100 Gm. Fer. Sulph.; 46 Gm. Monohyd. Carb. Sod.; 38 Gm. Clarif. Honey; 25 Gm. Sugar; syrup and distilled water, each q. s. Syrup is added to the ferrous sulphate solution and the wash water, to protect the ferrous salt against the absorption of oxygen. Dose, 250 Mg. (4 gr.).

Massa Hydrargyri. 33 Gm. Hg; 10 Gm. Glycyrr.; 15 Gm. Althæa; 9 Gm. Glycerin; Honey of Rose, 33 Gm. Triturate the Hg with Honey of Rose until it is extinguished and globules of mercury are no longer visible under a lens magnifying at least 10 diameters. Add the Glycerin, then the Glycyrrhiza and Althæa gradually, and continue trituration until the mass is homogeneous. Dose, 250 Mg. (4 gr.).

CONFECTIONES—CONFECTIONS.

Confectiones, or Confections: Saccharine, soft solids, in which one or more medicinal substances are incorporated, with the object of affording an agreeable form for their administration and a convenient method for their preservation. Old names, *conserves* and *electuaries*, under which they have been in use for centuries.

There are two official confections:—

Confectio Rosæ.—R. Rose, 80 Gm.; P. Sugar, 640 Gm.; Clar. Honey, 120 Gm.; Rose W., 160 Gm.

Sennæ.—Sen., 100 Gm.; Cas. Fist., 160 Gm.; Tamarind, 100 Gm.; Prune, 70 Gm.; Fig, 120 Gm.; P. Sug., 555 Gm.; Ol. Coriander, 5 Gm.; Water, to make 1000 Gm.

PILULÆ—PILLS.

Pilulæ, or Pills: Small, solid bodies, of a globular, ovoid, or lenticular shape, which are intended to be swallowed, and thereby produce medical action.

Of what a pill mass is composed, and what is required of it: It is composed of ingredients and excipients. It is required that the mass be 1, *adhesive;* 2, *firm;* 3, *plastic.*

How excipients are divided: Liquid and solid.

LIQUID EXCIPIENTS.

1. Water; use only when ingredients possess inherent adhesiveness that water will develop.

2. Syrup: adhesive.

3. Syrup Acacia: more adhesive.

4. Mucilage Acacia: most adhesive. Pills are liable to become hard and insoluble if acacia in any form is used as excipient.

5. Glycerin: somewhat adhesive. It is hygroscopic and keeps pills soft.

6. Glucose: very adhesive. Colorless, and non-volatile at ordinary temperature. Very valuable.

7. Honey: Good substitute for glucose, but colors white pills.

8. Extract of Malt: advantages of glucose, but possesses the disadvantage of dark color.

9. Glycerite of Starch: Glycerin—adhesiveness of starch and jelly. Thickness sometimes an objectionable feature.

10. Glycerite of Tragacanth: Similar to above.

11. Remington's general excipient: Glucose, 4 oz. av.; Glycerin, 1 oz. av.; Acacia (pulv.), 90 grains; Benzoic Acid, 1 grain. Dissolve benzoic acid in the glycerin, stir in acacia, then the glucose, and let stand till dissolved. *Moderate* heat may be used.

Solid Excipients.

1. Confection of Rose: Useful when it is desired to dilute active ingredients and increase bulk.
2. Bread Crumb: Used in making pills to contain croton oil, volatile oils, etc.
3. Powdered Althæa: too bulky for ordinary use.
4. Soap: valuable for resinous substances. Not only makes excellent mass, but increases the solubility of resins.
5. Rosin Cerate: for oxidizable substances, resins, etc.
6. Cacao Butter: for pills of permanganate of potassium, etc.
7. Petrolatum: for oxidizable substances as above.

How to divide the mass: On a graduated pill tile, or a pill machine. The former is made of porcelain, but preferably of plate glass. In either case the pill mass is rolled into a cylinder. In the former the mass is divided into the required number of portions with a spatula. In the latter it is divided by laying it upon the grooves of the lower board in the pill machine; the upper board is applied so that the cutting surfaces correspond with those on the lower board, and "by a slight backward and forward motion, with downward pressure, the mass is divided."

How to finish pills and keep them from adhering together: Finish them either by rolling between the thumb and finger, or rotate them under an adjustable pill finisher. To prevent them from adhering together, dust with rice flour, powdered magnesium carbonate, lycopodium, powdered althæa, or powdered licorice root.

How pills may be coated: Pills may be coated with various substances. With *gold* or *silver*, "by first placing a drop of syrup of acacia in a mortar, and after carefully spreading it over the surface with the end of the finger, dropping in the pills, rotating them so that they shall be uniformly coated with a very thin layer of mucilage, and then dropping them into the gold or silver leaf contained in the coater—"a smooth globular box, opening in the middle." An ordinary pill box will answer the purpose. With *gelatin*, by a simply constructed machine, in which the pills, arranged automatically in rows, are impaled on a system of pins, afterward dipped in a hot solution of gelatin, twirled gently until the coating is set, and rapidly dried by rotating on a wheel, after which they are removed from the pins. This can be accomplished in fifteen minutes. With *sugar*, by rotating them with a mixture of sugar and starch in a pill coater, which consists of a caldron-shaped copper vessel revolving at an incline, and heated by steam. The process can only be accomplished economically on the large scale.

How compressed pills are manufactured: On the small scale by Remington's compressed pill machine. It is made of cast steel, and has at the base two countersunk depressions, with a short post in the center of each; a lenticular depression is made in the upper surface of each post. Steel cylinders fit over the posts, and plungers fit in the cylinders, with lenticular depressions to correspond with those on the posts. The powder is compressed into pills between the lenticular surfaces by blows on the plungers with a mallet; the pills are removed by lifting the cylinders. On the large scale by power presses, working on a similar principle.

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TROCHISCI—TROCHES.

Trochisci, or Troches: Troches, or lozenges, are solid, discoid, or cylindrical masses, consisting chiefly of medicinal powders, sugar, and mucilage. They are prepared by making the ingredients into a mass which is rolled into a thin sheet, and cut into proper shape with a lozenge cutter.

TABLE OF TROCHES.

Title.	*Constituents—100 Troches.*	*Each Troche contains:*
TROCHISCI.		
Acidi Tannici.	Tannic Acid, 6 Gm.; Sugar, powd., 65 Gm.; Tragacanth, powd., 2 Gm.; Stronger Orange Flower Water, a sufficient quantity.	Tannic Acid, 0.06 Gm. (1 gr.).
Ammonii Chloridi	Ammonium Chloride, 10 Gm.; Extract of Liquorice, 20 Gm.; Tragacanth, powd., 2 Gm.; Sugar, powd., 40 Gm.; Syrup of Tolu, a sufficient quantity.	Ammonium Chloride, 0.1 Gm. (2 gr.).
Cubebæ.	Oleoresin of Cubeb, 2 Gm.; Oil of Sassafras, 1 Cc.; Extract of Liquorice, 25 Gm.; Acacia, powd., 12 Gm.; Syrup of Tolu, a sufficient quantity.	Oleoresin Cubeb, 0.02 Gm. ($\frac{1}{3}$ gr.).
Gambir.	Gambir, powd., 6 Gm.; Sugar, powd., 65 Gm.; Tragacanth, powd., 2 Gm.; Str. Or. Fl. Water, a sufficient quantity.	Gambir, 0.06 Gm. (1 gr.).
Glycyrrhizæ et Opii.	Extract of Liquorice, 15 Gm.; Powd. Opium, 0.5 Gm.; Acacia, powd., 12 Gm., Sugar, powd., 20 Gm.; Oil of Anise, 0.2 Cc.; Water, a sufficient quantity.	P. Opium, 0.005 Gm. ($\frac{1}{8}$ gr.).
Krameriæ.	Extract of Krameria, 6 Gm.; Sugar, powd., 65 Gm.; Tragacanth, powd., 2 Gm.; Stronger Orange Flower Water, a sufficient quantity.	Ext. Krameria, 0.06 Gm. (1 gr.).
Potassii Chloratis.	Potassium Chlorate, 15 Gm.; Sugar, powd., 60 Gm.; Tragacanth, powd., 3 Gm.; Water, a sufficient quantity.	Potassium Chlorate, 0.015 Gm. ($\frac{1}{4}$ gr.).
Santonini.	Santonin, 3 Gm.; Sugar, powd., 90 Gm.; Tragacanth, powd., 3 Gm.; Stronger Orange Flower Water, a sufficient quantity.	Santonin, 0.03 Gm. ($\frac{1}{2}$ gr.).
Sodii Bicarbonatis.	Sodium Bicarbonate, 18 Gm.; Sugar, powd., 54 Gm.; Nutmeg, bruised, 1 Gm.; Mucilage of Tragacanth, a sufficient quantity.	Sodium Bicarbonate, 0.18 Gm. (3 gr.).

SOLID PREPARATIONS FOR EXTERNAL USE.

CATAPLASMA—CATAPLASMS.

Cataplasms are soft, ointment-like, medicated substances, of such consistency that they may be easily spread upon muslin or similar material, and produce local or systemic effects.

Cataplasma Kaolini, Cataplasm of Kaolin: Kaolin, 577 Gm.; Boric Acid, 45 Gm.; Thymol, 0.5 Gm.; Methyl Salicylate, 2 Gm.; Oil of Peppermint, 0.5 Gm.; Glycerin, 375 Gm.; to make 1000 Gm.

CERATA—CERATES.

Cerata, or Cerates: Cerates are unctuous substances of such consistency that they may be easily spread, at ordinary temperatures, upon muslin or similar material, with a spatula, and yet not so soft as to liquefy and run when applied to the skin.

Why they are called cerates: Owing to the presence of wax (Cera).

What substances are used for bases: Oil, lard, petrolatum. Wax, and sometimes paraffin or spermaceti, in the presence of wax, are used to raise the melting-point of the bases.

There are six official cerates. Two classes:—

Title.	*Composition.*
Ceratum (Simple Cerate), ...	White Wax, 300 Gm.; White Petrolatum, 200 Gm.; Benzoated Lard, 500 Gm.
Ceratum Camphoræ, ...	Camphor Liniment, 100 Gm.; White Wax, 350 Gm.; White Petrolatum, 150 Gm.; Benzoated Lard, 400 Gm.
Ceratum Cantharidis (Blistering Cerate), ...	Cantharides, 320 Gm.; Liquid Petrolatum, 150 Gm.; Yellow Wax, 180 Gm.; Rosin, 180 Gm.; Lard, 170 Gm.
Ceratum Plumbi Subacetatis,.	Solution of Lead Subacetate, 20 Gm.; Wool-fat, 20 Gm.; Paraffin, 20 Gm.; White Petrolatum, 38 Gm.; Camphor, 2 Gm.
Ceratum Resinæ (Basilicon Ointment), ...	Rosin, 350 Gm.; Yellow Wax, 150 Gm.; Lard, 500 Gm.
Ceratum Resinæ Compositum (Deshler's Salve), ...	Rosin, 225 Gm.; Yellow Wax, 225 Gm.; Prepared Suet, 300 Gm.; Turpentine, 115 Gm.; Linseed Oil, 135 Gm.; to make 1000 Gm.

UNGUENTA—OINTMENTS.

Unguenta, or Ointments: Fatty preparations, of a softer consistence than cerates, intended to be applied to the skin by inunction.

Title.	*Per cent. of Active Constituent.*	*Base.*
UNGUENTUM.		
Unguentum, ...	White Wax, 20; Benz. Lard, 80.	
Acidi Borici, ...	Boric Acid, 10.	Paraffin, 10; Wht. Petrolatum, 80.
Aquæ Rosæ, ...	Stronger Rose Water, 19.	Sperm., 12.5; Wht. Wax, 12; Ol. Alm., 56; Sod. Bor., 5.
Belladonnæ, ...	Ext. Belladon. Leaves, 10.	Dil. Alch., 5; Wool-fat, 20; B. Lard, 65.
Chrysarobini, ...	Chrysarobin, 6.	B. Lard, 94.
Diachylon, ...	Lead Plaster, 50.	Olive Oil, 49; Ol. Lav. Fl., 1.
Gallæ, ...	Nutgall, 20.	Ointment, 80.
Hydrargyri, ...	Hg., 50; Oleate Hg., 2.	Prep. Suet, 23; B. Lard, 25.
Hydrargyri Ammoniati, .	Ammon. Hg., 10.	Wht. Petrolat., 50; H. Wool-fat, 40.

Title.	*Per cent. of Active Constituent.*	*Base.*
UNGUENTUM.		
Hydrargyri Dilutum,	Mercurial Ointment, 67.	Petrolatum, 33.
Hydrargyri Nitratis,	Hg. Nitrate, abt., 12.5.	Lard.
Hydrargyri Oxidi Flavi,	Yellow Hg. Ox., 10.	Water, 10; H. Wool-fat, 40; Pet., 40.
Hydrargyri Oxidi Rubri,	Red Hg. Ox., 10.	Water, 10; H. Wool-fat, 40; Pet., 40.
Iodi,	Iodine, 4; Potass. Iod., 4.	Benz. Lard, 80; Glycerin, 12.
Iodoformi,	Iodoform, 10.	Lard, 90.
Phenolis,	Phenol, 3.	Wht. Petrol., 97.
Picis Liquidæ,	Tar, 50.	Lard, 35; Yel. Wax, 15.
Potassii Iodidi,	Potass. Iod., 10; Potass. Carb., 0.6.	B. Lard, 80; Water, 10.
Stramonii,	Ext. Stramon., 10.	H. Wool-fat, 20; B. Lard, 65; Dil. Alc., 5.
Sulphuris,	Washed Sulphur, 15.	B. Lard, 85.
Veratrinæ,	Veratrin, 4.	B. Lard, 90; Ol. Alm., 6.
Zinci Oxidi,	Zinc Oxide, 20.	B. Lard, 80.
Zinci Steratis,	Zinc Stearate, 50.	Wht. Petrolatum, 50.

EMPLASTRA—PLASTERS.

Emplastra, or Plasters: Substances intended for external application, of such consistence that they adhere to the skin, and require the aid of heat in spreading them.

Plasters are usually spread on muslin, leather, paper, etc., and have as a basis, lead plaster, a gum-resin, or Burgundy pitch.

As plasters are usually bought of the manufacturer, ready-made, a description of the process for spreading them is omitted.

There are seventeen official plasters. Four classes:—

PLASTERS CONTAINING LEAD OR ADHESIVE PLASTER AS THEIR BASIS.

Title.	*Constituents.*
EMPLASTRUM.	
Adhæsivum,	Rubber, 20 Gm.; Petrol., 20 Gm.; Lead Plaster, 960 Gm.
Belladonnæ,*	Ext. Bel. Lvs., 300 Gm.; Adhesive Pl., 700 Gm.
Capsici,	Oleores. Caps., 0.25 Gm.; Adhesive Pl., q. s.
Hydrargyri,	Mercury, 30 Gm.; Oleate of Mercury, 1 Gm.; H. Wool-fat, 10 Gm.; Lead Plaster, 59 Gm.
Opii,	Ext. Opium, 6 Gm.; Water, 8 Cc.; Adhesive Pl., 90 Gm.
Plumbi,	Soap, 100 Gm.; Lead Acetate, 60 Gm.; Water, sufficient quantity.
Saponis,	Soap, 10 Gm.; Lead Plaster, 90 Gm.; Water, sufficient quantity.

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* Should not contain less than 0.38 per cent., nor more than 0.42 per cer alkaloids.

CHARTA—PAPERS.

Charta, or Papers: A small class of preparations intended for external application, made by applying the medicinal substance to the surface of the paper by the addition of some adhesive liquid.

Charta Sinapis.—Black Mustard, 100 Gm.; Rubber, 10 Gm.; Petroleum Benzin, Carbon Disulphide, of each q. s. Percolate Mustard with Petroleum Benzin, to rid it of fixed oil; dry. Dissolve Rubber in mixture of 100 Cc. each, Petroleum Benzin and Carbon Disulphide; make semi-liquid magma with mustard. Brush on rather stiff, well-sized paper. Each 60 sq. cent. of paper should contain about 4 Gm. black mustard deprived of oil. Before it is applied to the skin, Mustard Paper should be dipped in warm water for about fifteen seconds.

SUPPOSITARIA—SUPPOSITORIES.

What Suppositories are: Solid bodies of various weights and shapes, adapted for introduction into the different orifices of the human body and melting readily at blood heat.

Vehicles: The vehicles usually employed are Oil of Theobroma; Glycerinated Gelatin, or Sodium Stearate.

Requirements in preparing them: They should be prepared of materials of sufficient consistency to retain their shape when inserted, and, at the same time, melt at the temperature of the body.

U. S. Pharmacopœial Process for Making Oil of Theobroma Suppositories.

I. Rolled Suppositories.

Reduce the Medicinal Substance, if dry, to a very fine powder, or, if an extract, soften it with an appropriate liquid, then mix it thoroughly in a mortar with about an equal weight of grated Oil of Theobroma, and incorporate the remainder of the Oil of Theobroma until a homogeneous, plastic mass is obtained, adding, if necessary, a small quantity of Expressed Oil of Almond. Roll the mass on a graduated tile until a cylinder of the proper length is formed, divide this into the required number of equal parts, and with a spatula, or other convenient mechanical aid, form them into the desired shape.

II. Fusion and Moulding.

If the process of fusion is preferred, mix the Medicinal Substance with about an equal weight of grated Oil of Theobroma, as above directed, then thoroughly incorporate it with the remainder of the Oil of Theobroma, previously melted to a gentle heat, in a suitable vessel provided with a lip; then allow it to cool to about 38° C. (100.4° F.), and, when the mixture begins to congeal, pour it immediately into suitable, [illegible] moulds at a freezing temperature until [illegible] are ready to be removed.

[illegible] *Theobroma:* For suppositories [illegible] s, or substances which soften the vehicle, raise the melting-point of the Oil of Theobroma by the addition of from ten to fifteen per cent. of spermaceti, but the melting-point must not be raised above 37° C. (98.6° F.).

U. S. Pharmacopœial Process for Making Glycerinated Gelatin Suppositories.

For suppositories made with Glycerinated Gelatin the following process may be used:

Take of—
The Medicinal Substance, the prescribed quantity.
Glycerinated Gelatin.
Glycerin.
Water, each, a sufficient quantity.

Mix the Medicinal Substance, if solid and soluble, in Water or Glycerin, or if a miscible liquid, with a little water, and add sufficient Glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted Glycerinated Gelatin, and pour it at once into suitable moulds which have been greased with a small quantity of petrolatum. Cool the moulds thoroughly before removing the suppositories.

How to Facilitate the Filling of the Mould in Making Urethral Suppositories: Warm the moulds sufficiently before pouring.

How to Prepare Firmer Glycerinated Gelatin Suppositories: Substitute Mucilage of Acacia for a portion of the Water or Glycerin.

How to Proceed if the Medicinal Substance be Insoluble in Water or Glycerin: Thoroughly levigate the insoluble substance in a warm mortar with a sufficient quantity of Glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted Glycerin Gelatin, and pour it into suitable moulds as above directed. With bulky powders about one-half of the Glycerin may be replaced with water before levigation.

How Glycerinated Gelatin Suppositories May be Protected: Glycerinated Gelatin suppositories should be protected against the effects of heat and moisture and dry air by keeping them in tightly closed containers in a cool place.

Weights and Shapes Directed for Suppositories by the U. S. Pharmacopœia.

Rectal Suppositories should be cone-shaped or spindle-shaped, and when made from Oil of Theobroma should weigh about *two grammes.*

Urethral Suppositories (*Bougies*) should be pencil-shaped, pointed at one extremity, and either *seven centimetres* in length, weighing about *two grammes*, or *fourteen centimetres* in length, weighing about *four grammes*, when made with Glycerinated Gelatin. If prepared with Oil of Theobroma, they should weigh about one-half the above quantitie

Vaginal Suppositories should be globular or oviform in sh weigh about *ten grammes* if made with Glycerinated Gelatin *four grammes* if made with Oil of Theobroma.

Directions for Making Suppositoria Glycerini (the only official suppository): Take of Glycerin, 30 Gm.; of Monohydrated Sodium Carbonate, 0.5 Gm.; Stearic Acid, 2 Gm.; Water, 0.5 Cc.; to make 10 rectal suppositories. Dissolve the Monohydrated Sodium Carbonate in the water and add it to the Glycerin, contained in a dish, on a water-bath, add the stearic acid, and heat the mixture carefully until carbon dioxide ceases to be evolved, and the liquid is clear. Then pour the melted mass into suitable moulds, remove the suppositories when they are cold, and preserve them in tightly-stoppered glass vessels.

Three classes of suppository moulds*: 1. Individual moulds. 2. Divided moulds. 3. Hinged moulds.

Suppository Capsules: "Dr. F. E. Stewart has suggested the employment of gelatin shells, with conical caps, to be used as suppositories. The medicating ingredients are inserted in the lower portion; the upper margin is then moistened with water, and the cap inserted. Before introducing them into the rectum, they should be wet with sufficient water to enable them to slip in easily."

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* For excellent descriptions of the various forms of suppository moulds, see Remington's "Practice of Pharmacy."

PART III.

THE PREPARATIONS OF THE INORGANIC MATERIA MEDICA.

HYDROGEN, OXYGEN, AND WATER.

H; 1. O; 15.88. H_2O; 17.88.

Hydrogen and oxygen are colorless, odorless gases, of no special interest pharmaceutically, except that they combine to form water, which is of the greatest importance in pharmacy. Hydrogen is also unity for quantivalence and atomic weight.

H is combustible; O aids combustion.

AQUA, U. S.—Water. Potable water in its purest obtainable state. A colorless, limpid liquid, without odor and taste at ordinary temperatures, and odorless when heated to boiling; of a perfectly neutral reaction.

AQUA DESTILLATA, U. S.—Distilled Water.—A colorless, limpid liquid, without odor or taste, and of a neutral reaction. When 1000 Cc. are evaporated on a water-bath to dryness, not more than 0.075 Gm. of *residue* should remain.

In pharmacy, water is used principally as a solvent.

AQUA HYDROGENII DIOXIDI, U. S.—Solution of Hydrogen Dioxide, or Peroxide.—A slightly acid, aqueous solution of Hydrogen Dioxide (H_2O_2; = 33.76), which should contain, when freshly prepared, about 3 per cent. by weight of the absolute Hydrogen Dioxide, corresponding to about 10 vol. of available Oxygen. A colorless liquid, without odor, slightly acidulous to the taste, and producing a peculiar sensation and soapy froth in the mouth, liable to deteriorate upon keeping, or protracted agitation. If the stopper in the bottle be replaced by a pledget of cotton, deterioration is retarded. Made by decomposing barium peroxide with phosphoric acid, $BaO_2 + 2H_3PO_4 = Ba(H_2PO_4)_2 + H_2O_2$. Remove traces of the barium salt in the sol. by the cautious addition of H_2SO_4.

Antiseptic and disinfectant. Keep in cool place.

THE INORGANIC ACIDS.

Acids are distinguished from other bodies by THREE PROPERTIES. 1. They all contain hydrogen, and are sometimes called hydrogen salt
The hydrogen is capable of being replaced by metals to form sa
2. Those which are soluble in water have a characteristic, sour t

and corrosive action. 3. They act on litmus and other vegetable substances, changing their color.

The inorganic acids will be considered in the following order:—First, *Hydracids*, or those not containing O, derived from non-metallic elements. Ex.: HCl, HBr. Second, The non-metallic oxygen acids. Ex.: HNO_3, H_2SO_4, H_2SO_3, etc. Third, Arsenic Trioxide and Chromium Trioxide (formerly known as Arsenous and Chromic Acids), and the weak acid obtained from Boron, will not be treated as acids, but will be described under the headings of the elements from which they are derived.

The suffixes "ous" and "ic" are used as terminations to the names of acids containing O; the former denoting a lower proportion of O, the latter a higher amount. Ex.: Sulphur*ous* acid, H_2SO_3, contains less O than sulphur*ic* acid, H_2SO_4.

Many of the official inorganic acids are solutions of gases in water, the amount of gas in solution varying in the stronger acids; but the official class known as *diluted* acids are intended to be uniform.

Medical Properties.—Tonic and refrigerant in the dilute form; caustic and corrosive poisons when strong.

Antidotes.—Large amounts of *mild* alkalies administered with some bland, fixed oil. (Soap, carbonate or bicarbonate of sodium, dissolved in water; after which, draughts of oil.)

ACIDUM HYDRIODICUM DILUTUM, U. S.—Diluted Hydriodic Acid.—A solution of Hydriodic Acid (HI = 126.9), containing not less than 10 per cent. of water. A clear colorless liquid, odorless, acid taste, strongly acid reaction. Sp. gr. 1.106. Dose, 0.3 to 0.6 Cc. (5 to 10 ♏).

ACIDUM HYDROCHLORICUM, U. S.—Hydrochloric Acid. *Muriatic Acid.* A liquid composed of 31.9 per cent., by weight, of absolute Hydrochloric Acid, [HCl = 36.18], and 68.1 per cent. of water. It should be kept in glass-stoppered bottles. A colorless, fuming liquid, with a sp. gr. 1.58 at 25° C. (77° F.); pungent odor; intensely acid taste.

Preparation.—Principally as a by-product in the manufacture of soda-ash, by decomposing NaCl at a high temperature with H_2SO_4. The process has two steps:—

First Step.—Decomposition of half of the NaCl.

$$\underset{\substack{\text{Sodium}\\\text{Chloride.}}}{2NaCl} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Hydrochlo-}\\\text{ric Acid.}}}{HCl} + \underset{\substack{\text{Sodium}\\\text{Chloride.}}}{NaCl} + \underset{\substack{\text{Acid Sodium}\\\text{Sulphate.}}}{NaHSO_4}.$$

Second Step.—Decomposition remaining NaCl at 220° C. (428° F.), or over.

$$\underset{\substack{\text{Sodium}\\\text{Chloride.}}}{NaCl} + \underset{\substack{\text{Acid Sodium}\\\text{Sulphate.}}}{NaHSO_4} = \underset{\substack{\text{Hydrochlo-}\\\text{ric Acid.}}}{HCl} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4}.$$

The yellow color in common hydrochloric acid is due to organic sub-

peroxide, or free chlorine.

DILUTUM, U. S.—Diluted

id, containing 10 per cent. of

absolute HCl, and prepared by diluting 100 Gm. Hydrochloric Acid with 219 Gm. Distilled Water. Sp. gr. 1.049.

ACIDUM HYDROBROMICUM DILUTUM, U. S.—Diluted Hydrobromic Acid.—A liquid composed of not less than 10 per cent., by weight, of absolute Hydrobromic Acid, [$HBr = 80.36$], and about 90 per cent. of water. It should be kept in amber-colored, glass-stoppered bottles, protected from the light. A clear, colorless and odorless liquid. Sp. gr. 1.076; strongly acid taste.

Preparation.—Two methods—first, distillation; second, double decomposition and precipitation.

First Method (distillation).—Decompose potassium bromide with sulphuric acid. This forms acid potassium sulphate (crystals) and hydrobromic acid (liquid). Separate the liquid HBr from the crystals and distill it in a retort nearly to dryness, then add q. s. distilled water to make the product contain 10 per cent. actual HBr.

$$\underset{\substack{\text{Potassium}\\\text{Bromide.}}}{KBr} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Acid Potassium}\\\text{Sulphate.}}}{KHSO_4} + \underset{\substack{\text{Hydrobromic}\\\text{Acid.}}}{HBr.}$$

Second Method (precipitation).—Add tartaric acid to a solution of potassium bromide (400 gr. acid to 340 gr. bromide in 4 fl. oz. water). Tartrate of potassium precipitates and HBr remains in solution.

ACIDUM HYPOPHOSPHOROSUM, U. S.—Hypophosphorous Acid.—A liquid composed of 30 per cent., by weight, of absolute Hypophosphorous Acid, [$PO \,.\, H_2(OH) = 65.53$], and 70 per cent. of water. It should be kept in glass-stoppered bottles. A colorless liquid, without odor, and having an acid taste. Sp. gr., about 1.130 at 25° C. (77° F.).

ACIDUM HYPOPHOSPHOROSUM DILUTUM, U. S.—Diluted Hypophosphorous Acid.—A liquid composed of 10 per cent, by weight of absolute Hypophosphorous Acid, [$PO \,.\, H_2(OH) = 65.53$], and 90 per cent. of water. Sp. gr. about 1.042 at 25° C. (77° F.).

ACIDUM NITRICUM, U. S.—Nitric Acid. HNO_3. *Aqua Fortis.*—A colorless, fuming, liquid, very caustic and corrosive, and having a peculiar, somewhat suffocating odor, composed of 68 per cent., by weight, absolute Nitric Acid, [HNO_3, or $NO_2 \,.\, OH = 62.57$]. Sp. gr. 1.403 at 25° C. (77° F.), and 32 per cent. water, ($HNO_3 = 62.89$).

Preparation.—By acting on Chili Saltpetre (sodium nitrate) with H_2SO_4. If two molecules of $NaNO_3$ and one of H_2SO_4 be taken, the reaction will be as follows:—

Decomposition of 1st molecule $NaNO_3$.

$$\underset{\substack{\text{Sodium}\\\text{Nitrate.}}}{NaNO_3} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Acid Sodium}\\\text{Sulphate.}}}{NaHSO_4} + \underset{\substack{\text{Nitric}\\\text{Acid.}}}{HNO_3.}$$

Then by raising the heat, the $NaHSO_4$, acts upon the second molecule of $NaNO_3$.

Decomposition of 2d molecule NaN_3.

$$\underset{\substack{\text{Sodium}\\\text{Nitrate.}}}{NaNO_3} + \underset{\substack{\text{Acid Sodium}\\\text{Sulphate.}}}{NaHSO_4} = \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4} + \underset{\substack{\text{Nitric}\\\text{Acid.}}}{HNO_3.}$$

There are several varieties of nitric acid in commerce. The official acid of 1.414 sp. gr. is termed 43° acid. The ordinary weaker commercial acid of 1.355 sp. gr. is called 38° acid. The reddish acid, known as *nitrous* acid, is nitric acid containing more or less nitrogen tetroxide (N_2O_4). The same acid may be made by impregnating nitric acid with nitrogen dioxide (N_2O_2).

The effect of red heat on nitric acid.—It evolves O, as follows:—

$$4HNO_3 + \text{Heat} = (N_2O_4)_2 + O_2 + (H_2O)_2.$$

The Great Characteristic Property of Nitric Acid.—It oxidizes sulphur and phosphorus, giving rise to sulphuric and phosphoric acids, and it oxidizes all the metals with but few exceptions. It is the great oxidizing agent.

ACIDUM NITRICUM DILUTUM, U. S.—Dilute Nitric Acid.—Should contain 10 per cent., by weight, absolute Nitric Acid. Sp. gr. 1.054 at 25° C. (77° F.). Prepared by diluting 100 Gm. Nitric Acid with 580 Gm. Distilled Water.

ACIDUM NITROHYDROCHLORICUM, U. S.—Nitrohydrochloric Acid. *Nitromuriatic Acid. Aqua Regia.*—A golden-yellow, fuming, and very corrosive liquid, having a strong odor of Cl, and containing nitrosyl chloride and free chlorine. It is made by mixing together 180 Cc. nitric acid, 820 Cc. hydrochloric acid in a capacious open glass vessel, and, after effervescence ceases, preserving in a cool, dark place, in glass-stoppered bottles, half full.

$$\underset{\substack{\text{Nitric}\\\text{Acid.}}}{HNO_3} + \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{3HCl} = \underset{\substack{\text{Nitrosyl}\\\text{Chloride.}}}{NOCl} + \underset{\text{Chlorine.}}{Cl_2} + \underset{\text{Water.}}{2H_2O.}$$

Nitrohydrochloric acid should be kept in a cool, dark place, because it loses Cl by heat, and its Cl is converted into HCl by the action of light and the decomposition of its water.

It is called *Aqua Regia*, because of its power of dissolving gold, the king of metals.

It is indispensable, in keeping and dispensing it, that care should be taken not to confine it until all effervescence ceases, or explosion is likely to occur. And the same care should be exercised in dispensing it in mixtures. Average dose, 0.2 Cc. (3 ♏).

ACIDUM NITROHYDROCHLORICUM DILUTUM, U. S.—Diluted Nitrohydrochloric Acid.—A colorless, or pale yellowish liquid, having a faint odor of Cl, with a very acid taste, made by mixing 40 Cc. nitric acid with 180 Cc. hydrochloric acid, and after effervescence has entirely ceased, diluting with 780 Cc. distilled water to make 1000 Cc.

These directions should be literally obeyed, because, unless the acids are mixed while concentrated, NOCl and Cl are not produced.

Should be kept in dark-amber colored, glas
cool place. Average dose, 1 Cc. (15 ♏).

ACIDUM SULPHURICUM, U. S
riol.—A colorless liquid, of an oily
caustic and corrosive. Sp. gr. not be

A liquid composed of not less than 92.5 per cent., by weight, of absolute Sulphuric Acid, [H_2SO_4 or $SO_2(OH)_2 = 97.35$], and about 7.5 per cent. of water. It should be kept in glass-stoppered bottles.

Sulphuric Acid is prepared by burning S or FeS_2 (iron pyrites) in the air, by which SO_2 is formed. These fumes are conducted into leaden chambers and allowed to mix with steam and nitrous fumes obtained from the decomposition of sodium nitrate. The SO_2 is oxidized into SO_3 by the nitrous fumes containing nitrogen tetroxide (N_2O_4), which gives up part of its O for that purpose. SO_3 then unites with the H_2O (steam) present to form H_2SO_4. The H_2SO_4 condenses on the floor of the leaden chambers and is afterward drawn off and concentrated.

The reactions are as follows: First two molecules of SO_2 react with one molecule of N_2O_4, thus:—

$$\underset{\substack{\text{Sulphur}\\ \text{Dioxide.}}}{2SO_2} + \underset{\substack{\text{Nitrogen}\\ \text{Tetroxide.}}}{N_2O_4} = \underset{\substack{\text{Sulphur}\\ \text{Trioxide.}}}{2SO_3} + \underset{\substack{\text{Nitrogen}\\ \text{Dioxide.}}}{N_2O_2}.$$

Then

$$\underset{\substack{\text{Nitrogen}\\ \text{Dioxide.}}}{N_2O_2} + \underset{\text{Oxygen.}}{O} = \underset{\substack{\text{Nitrogen}\\ \text{Tetroxide.}}}{N_2O_4}$$

Then

$$\underset{\substack{\text{Sulphur}\\ \text{Trioxide.}}}{SO_3} + \underset{\text{Water.}}{H_2O} = \underset{\substack{\text{Sulphuric}\\ \text{Acid.}}}{H_2SO_4}$$

The nitrogen tetroxide thus acts as a carrier of atmospheric O, whereby the SO_2 is changed into SO_3. This latter compound unites with steam (H_2O) to form H_2SO_4.

ACIDUM SULPHURICUM AROMATICUM, U. S.—Elixir of Vitriol.—An aromatic elixir of sulphuric acid, prepared by mixing together Sulphuric Acid 111 Cc.; Tr. Ging. 50 Cc.; Ol. Cinnam. 1 Cc.; Alcohol to 1000 Cc. Should contain not less than 20 per cent., by weight, of absolute Sulphuric Acid, partly in the form of ethyl-sulphuric acid. Sp. gr., about 0.933 at 25° C. (77° F.). Average dose, 1 Cc. (15 ♏).

ACIDUM SULPHURICUM DILUTUM, U. S.—Diluted Sulphuric Acid.—A colorless liquid, containing 10 per cent., by weight, of absolute Sulphuric Acid, with sp. gr. 1.067 at 25° C. (77° F.), and prepared by diluting 100 Gm. Sulphuric Acid with 825 Gm. Distilled Water to make 925 Gm. Average dose, 2 Cc. (30 ♏).

ACIDUM SULPHUROSUM, U. S.—Sulphurous Acid.—An aqueous solution containing not less than 6 per cent., by weight, of sulphur dioxide, [$SO_2 = 63.59$], and about 94 per cent. of water. A colorless liquid having the characteristic odor of burning sulphur and an acid, sulphurous taste, with sp. gr. 1.028, at 25° C. (77° F.), and strongly acid reaction. Average dose, 2 Cc. (30 ♏).

Preparation.—By pouring 60 Cc. H_2SO_4 on 20 Gm. coarsely powdered charcoal, in a flask connected with a wash-bottle, and a bottle partially filled with 1000 Cc. distilled water. Gentle heat is applied, and the gas distilled over. A bottle containing a solution of Na_2CO_3 is provided to absorb the excess of gas that bubbles up through the distilled water, and the latter is kept cool by placing ice around the bottle, as cold water will absorb more gas than warm water.

Equation for the reaction that occurs:—

$$\underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{4H_2SO_4} + \underset{\text{Carbon}}{C_2} = \underset{\substack{\text{Sulphur}\\\text{Dioxide.}}}{4SO_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{2CO_2} + \underset{\text{Water.}}{4H_2O}$$

ACIDUM PHOSPHORICUM, U. S.—Phosphoric Acid.—*Syrupy Phosphoric Acid.* A liquid compound of 85 per cent., by weight, of absolute Orthophosphoric Acid, [H_3PO_4 or $PO(OH_3) = 97.29$], and 15 per cent. of water. It should be kept in glass-stoppered bottles. A colorless liquid of a syrupy consistence, without odor, and having a strongly acid taste, of sp. gr. 1.707.

The process for making this acid was abandoned by the U. S. P. of 1890 on account of the danger usually attending the operation, and because it can be made more profitably on the large scale. A modification of this process, safe to use, is as follows: Pour 12 fl. oz. dist. water mixed with 11 fl. oz. HNO_3 into a 2-pint flask. Add 40 grains bromine and shake gently until dissolved. Now add 2 oz. P. and set aside so that nitrous vapors may be carried off without injury.

ACIDUM PHOSPHORICUM DILUTUM, U. S.—Diluted Phosphoric Acid.—A colorless liquid of sp. gr. 1.057 at 25° C. (77° F.), containing 10 per cent. absolute orthophosphoric acid, by weight, and prepared by diluting 100 Gm. of phosphoric acid with 750 Gm. distilled water to make 850 Gm. Average dose, 2 Cc. (30 ♏).

A precipitate sometimes occurs on mixing this acid with tincture of chloride of iron, generally due to the presence of pyrophosphoric acid. Pyrophosphate of iron is formed as an insoluble gelatinous precipitate.

CHLORINE, BROMINE, AND IODINE.

(THE HALOGENS.)

Cl; 35.18. Br; 79.36. I; 125.90.

The four Halogens (salt producers) are *Chlorine*, *Bromine*, *Iodine*, *Fluorine*. The last is not used in Pharmacy.

CHLORINE—CHLORINE. Cl; 35.18.

A greenish-yellow, gaseous body, having a very suffocating odor, and sp. gr. 2.45 (when liquefied, 1.38).

LIQUOR CHLORI COMPOSITUS, U. S [illegible] **of Chlorine. Chlorine Water.** [To r [illegible] 1890]. An aqueous solution, containi [illegible] 0.4 per cent. of Chlorine, [Cl = 35. [illegible] and potassium chloride. Made by p [illegible] HCl with Potassium Chlorate and [illegible] saturated solution is produced.

CALX CHLORINATA, U. S.—Chlorinated Lime. Chlorinated Calcium Oxide. [Calx Chlorata, Pharm. 1890.] A compound resulting from the action of chlorine upon calcium hydroxide, and containing not less than 30 per cent. of available chlorine. It is often improperly called "Chloride of Lime." A white, or grayish-white, granular powder, becoming moist and gradually decomposing on exposure to air, and having a repulsive, saline taste. Average dose, 0.250 Gm. = 250 Mg. (4 gr.).

Its chemical formula is probably $CaOCl_2$, yielding by decomposition with water, calcium hypochlorite and calcium chloride. It is used as a disinfectant and for bleaching purposes, and its usefulness depends on its chlorine, which being loosely combined, is, therefore, available.

LIQUOR SODÆ CHLORINATÆ, U. S.—Solution of Chlorinated Soda. *Labarraque's Solution.*—[Liquor Sodæ Chlorata, Pharm. 1890.] An aqueous solution of several chlorine compounds of sodium, containing at least 2.4 per cent., by weight, of available chlorine. A clear, pale greenish liquid, having a faint odor of chlorine with a disagreeable alkaline taste, and an alkaline reaction, made by decomposing solution of chlorinated lime with monohydrated sodium carbonate.

Equation expressing the reaction:—

$$\underset{\text{Chlorinated Lime.}}{Ca(OCl)_2 + CaCl_2} + \underset{\substack{\text{Sodium}\\ \text{Carbonate.}}}{2Na_2CO_3} = \underset{\text{Chlorinated Soda.}}{2NaOCl + 2NaCl} + \underset{\substack{\text{Calcium}\\ \text{Carbonate.}}}{2CaCO_3}.$$

Eau de Javelle (*Javelle Water*) is a French preparation made with K_2CO_3 instead of Na_2CO_3.

BROMUM, U. S.—BROMINE. Br; 79.36.

A heavy, dark brownish-red, mobile liquid evolving, even at ordinary temperatures, reddish fumes highly irritating to the eyes and lungs; peculiarly suffocating odor, resembling that of chlorine. Prepared by decomposing crude magnesium bromide (bittern) with chlorine gas. Sp. gr., 2.990 to 3.000 at 15° C. (59° F.). Should contain not less than 97 per cent. of pure Bromine.

$$\underset{\substack{\text{Magnesium}\\ \text{Bromide.}}}{MgBr_2} + \underset{\text{Chlorine.}}{2Cl} = \underset{\substack{\text{Magnesium}\\ \text{Chloride.}}}{MgCl_2} + \underset{\text{Bromine.}}{2Br.}$$

IODUM, U. S.—IODINE. I = 125.90.

Heavy, bluish-black, dry and friable, rhombic plates, of a metallic lustre, distinctive odor, sharp and acrid taste, formerly obtained exclusively from the ashes of seaweed (kelp), but now made from the mother-liquor obtained from the crystallization of sodium nitrate in South America, in which it occurs in the forms of sodium iodide and iodate. It should contain not less than 99 per cent. of pure Iodine. (The U. S. P. gives process for assay.) Average dose, 0.005 Gm. = 5 Mg. ($\frac{1}{10}$ gr.).

Preparation.—The iodides are decomposed by Cl, iodine being set free, whilst the iodine from the iodates is precipitated by acid sodium sulphite. *Kelp* contains iodine in the form of NaI. The solution from it is treated with H_2SO_4 and distilled with MnO_2. The I condenses in glass receivers.

$$\underset{\text{Sodium Iodide.}}{2NaI} + \underset{\text{Sulphuric Acid.}}{2H_2SO_4} + \underset{\text{Manganese Dioxide.}}{MnO_2} = \underset{\text{Iodine.}}{I_2} + \underset{\text{Manganese Sulphate.}}{MnSO_4} + \underset{\text{Sodium Sulphate.}}{Na_2SO_4} + \underset{\text{Water.}}{2H_2O.}$$

The U. S. P. preparations of Iodine: *Tinctura Iodi, Liquor Iodi Compositus, Unguentum Iodi.*

SYRUPUS ACIDI HYDRIODICI, U. S.—Syrup of Hydriodic Acid.—A syrupy liquid, containing 1 per cent. of absolute Hydriodic Acid [HI = 126.9], having the sp. gr. of about 1.190 at 25° C. (77° F.), and made by mixing 100 Gm. of Diluted Hydriodic Acid with 300 Gm. of Water, and 600 Gm. of Syrup. Average dose, 4 Cc. (1 fl. dr.).

SULPHUR AND PHOSPHORUS.

S; 31.83. P; 30.77.

SULPHUR. S; 31.83.

Sulphur occurs uncombined in Sicily and in other parts of the world, and is widely diffused in the form of sulphates and sulphides.

Roll sulphur is prepared by fusing sulphur, permitting it to stand, to separate impurities, and then pouring into cylindrical moulds.

Three forms of sulphur are official: *sublimed, washed*, and *precipitated* sulphur.

SULPHUR SUBLIMATUM, U. S.—Flowers of Sulphur.—Should contain not less than 99 per cent. of pure Sulphur. A fine, yellow powder, having a slight characteristic odor, and a faintly-acid taste, made by conducting the vapor of sulphur into a cool chamber, where it condenses in the form of crystalline powder. Average dose, 4 Gm. (60 gr.). U. S. Preparations: *Sulphur Lotum, Sulphur Præcipitatum.*

SULPHUR LOTUM, U. S.—Washed Sulphur. [S = 31.83.]—A fine yellow powder, without odor or taste, made by washing sublimed sulphur with water containing ammonia, to rid it of sulphuric acid and other impurities. Average dose, 4 Gm. (60 gr.). U. S. Preparations: *Pulvis Glycyrrhizæ Compositus, Unguentum Sulphuris.*

SULPHUR PRÆCIPITATUM, U. S.—Precipitated Sulphur. [S = 31.83.]—A fine amorphous powder, of a pale yellow color, without odor or taste, made by precipitating a solution of calcium disulphide with hydrochloric acid. Average dose, 4 Gm. (60 gr.).

Calcium disulphide is prepared by boiling unslaked lime with sublimed sulphur, cooling, and filtering off the clear solution of calcium disulphide, which is then precipitated with HCl.

Equations describing the reactions that occur:—

1st. The lime and sulphur react to form calcium disulphide and calcium thiosulphite (hyposulphite).

$$\underset{\text{Calcium Oxide.}}{3CaO} + \underset{\text{Sulphur.}}{6S} = \underset{\text{Calcium Disulphide.}}{2CaS_2} + \underset{\text{Calcium Thiosulphate.}}{CaS_2O_3.}$$

2d. HCl is added, which precipitates the sulphur.

$$\underset{\substack{\text{Calcium}\\\text{Disulphide.}}}{2CaS_2} + \underset{\substack{\text{Calcium}\\\text{Thiosulphate.}}}{CaS_2O_3} + \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{6HCl} = \underset{\substack{\text{Calcium}\\\text{Chloride.}}}{3CaCl_2} + \underset{\text{Sulphur.}}{6S} + \underset{\text{Water.}}{3H_2O.}$$

Should contain, when dried, not less than 99.5 per cent. of pure sulphur.

SULPHURIS IODIDUM, U. S.—Sulphur Iodide.—Brittle masses of a crystalline fracture and a grayish-black, metallic lustre, having the odor of iodine and a somewhat acrid taste; made by heating 20 Gm. sulphur with 80 Gm. iodine. It is also known as *subiodide of sulphur*, or *iodine disulphide* (?), S_2I_2.

CARBONEI DISULPHIDUM, U. S.—Carbon Disulphide. [CS_2 = 75.57.]—A clear, colorless, highly refractive liquid, very diffusive, having a strong, characteristic but not fetid odor, and sharp, aromatic taste. Sp. gr. 1.256 to 1.257 at 25° C. (77° F.). Made by the direct combination of carbon and sulphur, at a moderate red heat.

Preparation.—Charcoal is heated to redness, in a vertical cylinder provided with a lateral tubulure near the bottom, through which sulphur is admitted. The sulphur melts, volatilizes, and unites with the carbon, forming carbon bisulphide. This distills over and condenses in tubes, which collect it while allowing the H_2S formed at the same time to escape. It is then purified by agitation with mercury, and distillation in contact with white wax. By repeated rectification it can be made odorless. Used principally as a solvent. Best solvent for rubber, etc.

PHOSPHORUS. P; 30.77.

PHOSPHORUS, U. S. PHOSPHORUS. [P = 30.77.]—It should contain not less than 99.5 per cent. of pure phosphorus. A translucent, nearly colorless solid, of a waxy lustre, having, at ordinary temperatures, about the consistence of beeswax. Average dose, 0.0005 Gm. = 0.5 Mg. ($\frac{1}{128}$ gr.).

Phosphorus is prepared by deoxidizing phosphoric acid with carbon. This is accomplished by heating acid calcium phosphate, obtained by treating calcium phosphate with sulphuric acid, with charcoal.

$$\underset{\substack{\text{Calcium}\\\text{Phosphate.}}}{Ca_3(PO_4)_2} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} = \underset{\substack{\text{Acid Calcium}\\\text{Phosphate.}}}{CaH_4(PO_4)_2} + \underset{\substack{\text{Calcium}\\\text{Sulphate.}}}{2CaSO_4.}$$

The process is conducted in a retort. Carbon, at a high temperature, takes oxygen from the phosphoric acid, and becomes carbonic acid. Phosphorus and carbonic oxide distill over, and the former is condensed in water, while the latter escapes.

Red Phosphorus (Amorphous Phosphorus).—A non-luminous, non-poisonous, red amorphous powder, consisting of phosphorus in one of its allotropic forms, prepared by allowing phosphorus to remain in an atmosphere of carbon dioxide for several days, at a temperature ranging from 215° to 250° C. (419°–482° F.). By heating it to 280° C. (536° F.) it is converted into ordinary phosphorus.

Phosphorus forms with oxygen two oxides—*phosphorus*, P_2O_3, or phosphorous trioxide, and *phosphoric*, P_2O_5, or phosphorous pentoxide. Corresponding to the last of these are three acids, known as orthophosphoric (tribasic phosphoric), H_3PO_4, phosphoric, $H_4P_2O_7$, and metaphosphoric, HPO_3.

Orthophosphoric Acid is formed by dissolving P_2O_5 in boiling water.

Pyrophosphoric Acid is formed by the heating of the tribasic phosphoric acid to 213° C. (415.4° F.).

Metaphosphoric Acid is formed by the ignition of the tribasic acid, or by dissolving P_2O_5 in cold water.

Phosphorous Acid, H_3PO_3, cannot be formed directly from phosphorous trioxide. This is a dibasic acid, containing one H atom not replaceable by metal.

Hypophosphorous Acid, H_3PO_2, is not capable of being derived directly from hypophosphorous oxide. It is monobasic, containing two hydrogen atoms not replaceable by metal.

CARBON, BORON, AND SILICON.

C; 11.91. B; 10.9. Si; 28.2.

CARBON. C; 11.91.

Carbon is a constituent of all organic substances, and found in nature in the forms of coal, plumbago, diamond, etc.

The two oxides of carbon and their corresponding acids are, carbon dioxide, CO_2, and carbonic acid, $H_2CO_3(CO_2 + H_2O = H_2CO_3)$, carbon monoxide, CO, which is of little interest in pharmacy.

Carbon Dioxide, CO_2.—A colorless, odorless gas, with slightly acid taste, heavier than the air, incombustible and a non-supporter of combustion. Water absorbs its own volume of it at ordinary temperature and pressure, and many times its volume under cold and pressure.

Aqua Acidi Carbonici or "Soda Water." A solution of Carbon dioxide in water made under pressure, and dispensed under the well-known name, "Soda Water." It was formerly official.

CARBO ANIMALIS, U. S.—Animal Charcoal. *Bone Black, or Ivory Black.*—Charcoal prepared from bone. Dull black, granular fragments, or a dull-black powder, odorless and nearly tasteless.

Preparation.—Bones consist of calcium phosphate and carbonate with animal matter. In the destructive distillation, which is conducted in iron cylinders without access of air, the N and H of the animal matter unite to form NH_3, which distills over, leaving most of the C behind with the calcium salts.

Bone Spirit and Bone Oil.—The ammoniacal liquor and dark tarry liquid that distill over are known as bone spirit and bone oil, respectively.

CARBO ANIMALIS PURIFICATUS, U. S.—Purified Animal Charcoal.—Animal charcoal purified from calcium salts by HCl.

CARBO LIGNI, U. S.—Charcoal.—Prepared by burning wood out of contact with the air, whereby its volatile portions, hydrogen, [illegible] water, etc., are dissipated, carbon, mixed with mineral salts. Average dose, 1 Gm. (15 gr.).

BORON. B; 10.9.

Boron exists in three allotropic forms, amorphous, crystalline, and graphitoidal (same as carbon).

The result of its combination with O and H is Boric (Boracic) Acid, H_3BO_3.

ACIDUM BORICUM, U. S.—Boric Acid. *Boracic Acid.* $H_3BO_3 = 61.54$.—Is obtained in the lagoons in Tuscany; in California lakes, etc., in the forms of boric acid and borate of sodium (borax). Boric acid is made by decomposing borax with HCl:—

$$\underset{\text{Sodium Borate.}}{Na_2B_4O_7 . 10H_2O} + \underset{\text{Hydrochloric Acid.}}{2HCl} = \underset{\text{Sodium Chloride.}}{2NaCl} + \underset{\text{Boric Acid.}}{4H_3BO_3} + \underset{\text{Water.}}{5H_2O.}$$

It should contain not less than 99.8 per cent. of pure Boric Acid, $[B(OH)_3]$.

Acidum Boricum occurs in the form of transparent, colorless scales, of a somewhat pearly lustre, or six-sided, triclinic crystals, or a light, white, very fine powder; slightly unctuous to the touch; odorless, having a faintly bitter taste, and permanent in the air. Soluble in 18 parts of water, 15.3 parts of alcohol, and 4.6 parts of glycerin at 25° C. (77° F.); in 3 parts of boiling water and 4.3 parts of boiling alcohol. Average dose, 0.500 Gm. = 500 Mg. (7½ gr.).

Official Preparation.—Unguentum Acidi Borici.

LIQUOR ANTISEPTICUS. Antiseptic Solution. See Liquores, Part I.

SILICON. Si; 28.2.

Silicon exists in three allotropic forms, amorphous, crystalline, and graphitoidal.

It is found in combination with Al, Mg, and Ca, in pumice, meerschaum, asbestos, talcum, soapstone, etc., and as an anhydride (silica) in sand, flint, quartz, etc.

KAOLINUM, U. S. Kaolin. A native aluminium silicate, consisting chiefly of the pure silicate, $[H_2Al_2Si_2O_8 + H_2O = 257.12]$, powdered and freed from gritty particles by elutriation. Sometimes called China Clay, or Porcelain Clay. Used for making Cataplasma Kaolini (see under Cataplasms, Part II).

TALCUM, U. S. Talc. A native, hydrous magnesium silicate, also called French chalk or Soapstone.

TALCUM PURIFICATUM, U. S. Purified Talc. Talc, in fine powder, 500 Gm.; HCl, 500 Cc.; Water, q. s. Wash with portions of HCl and Water, then with water, repeatedly, until a portion of the wash water (filtered and acidified with HNO_3) fails to become opalescent upon the addition of Silver Nit. Sol. Transfer magma to strainer, drain, dry at 110° C. (230° F.). Used for making medicated waters.

POTASSIUM, SODIUM, LITHIUM, AND AMMONIUM.

K; 38.86. Na; 22.88. Li; 6.98. NH_4; 17.93.

Alkaline Metals and their Characteristics.—The alkaline metals are Potassium, Sodium, and Lithium. They are characterized, 1, by their silvery-white appearance; 2, softness; 3, powerful affinity for oxygen; 4, lightness, being lighter than water, on which they float and take fire spontaneously, owing to their power of decomposing that fluid. They are all univalent.

The metals may be obtained by exposing their carbonates, mixed with charcoal, to an intense heat, carbon monoxide being liberated, and the vaporized metals condensed in appropriate receivers.

Ammonium is a compound radical, consisting of NH_4, but, owing to its many analogies with the alkali metals, classed with them.

Characteristics of Alkalies.—1. They combine with acids to form salts. 2. They restore the color of reddened litmus, turn vegetable blues to green, and yellow to brown. 3. Their taste is characteristic and, if concentrated, caustic.

POTASSIUM. K; 38.86.

Sources of Potassium Salts.—Formerly, wood ashes; now, the principal source is an impure chloride from the Stassfurt mines, in Germany.

Lye, Potash, and *Pearlash.*—When wood is burned to ashes, the salts of potassium contained therein are converted into *carbonates.* Wood ashes are placed in a conical wooden vessel, termed a *leach,* and water allowed to percolate through, which becomes impregnated with the potassium carbonate contained in the ashes, and the solution is called *lye.* By evaporating lye to dryness in an iron pot, a solid remains, consisting principally of impure carbonate, which is called *potash.* Potash, calcined on the hearth of a reverberatory furnace, loses its water and becomes white. It is then known as *pearlash,* and is an impure carbonate of potassium.

POTASSII HYDROXIDUM, U. S. Potassium Hydroxide. KOH = 55.74. [Potassa, Pharm. 1890.] *Potassium Hydrate, Potassium Hydroxide, Caustic Potash.* Should contain not less than 85 per cent. of pure anhydrous Potassium Hydroxide, and not more than 2 per cent. of other inorganic substances, with the exception of water. Dry, white flakes, fused masses, or in pencils, hard and brittle, showing a crystalline fracture; odorless or having a faint odor of lye; very acrid and caustic taste; strongly alkaline reaction. Great caution is necessary in tasting and handling it, as it rapidly destroys organic tissues. Exposed to the air, it readily absorbs carbon dioxide and moisture, and deliquesces. Prepared from wood ashes by lixiviating, evaporating, purifying, redissolving, treating with li [illegible] d casting into moulds.

K_2C [illegible]
Pot [illegible]
Car [illegible]

LIQUOR POTASSII HYDROXIDI, U. S. Solution of Potassium Hydroxide. [Liquor Potassæ, Pharm. 1890.] An aqueous solution, containing about 5 per cent. of Potassium Hydroxide, [KOH = 55.74]. A clear, colorless liquid, odorless, having a very acrid and caustic taste, and strongly alkaline reaction. Made by dissolving 60 Gm. of Potassium Hydroxide in 940 Gm. Distilled Water. Average dose, 1 Cc. (15 ♏).

POTASSII ACETAS, U. S.—Potassium Acetate. $KC_2H_3O_2$; 97.44.—It should contain, when thoroughly dried, not less than 98 per cent. of pure Potassium Acetate, [CH_3COOK]. A white powder, or in crystalline masses of a satin-like lustre, odorless, and having a warming, saline taste. Very deliquescent on exposure to the air. Average dose, 2 Gm. (30 gr.). Made by decomposing potassium bicarbonate with acetic acid, filtering and evaporating, carefully avoiding contact with iron.

$$\underset{\substack{\text{Potassium}\\\text{Bicarbonate.}}}{KHCO_3} + \underset{\text{Acetic Acid.}}{HC_2H_3O_2} = \underset{\substack{\text{Potassium}\\\text{Acetate.}}}{KC_2H_3O_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O.}$$

POTASSII BICARBONAS, U. S.—Potassium Bicarbonate. $KHCO_3$; 99.41.—Should contain not less than 99 per cent. of pure Potassium Bicarbonate, [$CO(OH)(OK)$]. Colorless, transparent, monoclinic prisms, or a colorless, odorless, granular powder; saline and slightly alkaline taste; permanent in the air. Average dose, 2 Gm. (30 gr.). Made by passing carbon dioxide into a solution of carbonate, evaporating, and crystallizing.

$$\underset{\substack{\text{Potassium}\\\text{Carbonate.}}}{K_2CO_3} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O} = \underset{\substack{\text{Potassium}\\\text{Bicarbonate.}}}{2KHCO_3.}$$

POTASSII BITARTRAS, U. S.—Potassium Bitartrate. $KHC_4H_4O_6$ = 186.78. *Cream of Tartar.* It should not contain less than 99 per cent. of pure Potassium Bitartrate, [$C_2H_2(OH)_2(COOH)(COOK)$]. Colorless or slightly opaque, rhombic crystals, or a white, somewhat gritty powder; odorless; pleasant, acidulous taste; permanent in the air. Made by purifying *argol*, the sediment deposited in wine casks during fermentation. Average dose, diuretic, 2 Gm. (30 gr.).

POTASSII BROMIDUM, U. S.—Potassium Bromide. KBr; 118.22.—Should contain not less than 97 per cent. of pure Potassium Bromide. Colorless or white cubical crystals, or a granular powder; odorless, and having a strongly saline taste. Permanent in the air. Average dose, 1 Gm. (15 gr.). Made by treating solution of potassa with bromine and charcoal.

The rationale of the process is as follows: Bromine added to solution potassa forms *bromide* and *bromate*. The solution is evaporated to dryness, and heated with charcoal, which deoxidizes the bromate, CO escaping.

$$\underset{\substack{\text{Potassium}\\\text{Bromate.}}}{2KBrO_3} + \underset{\text{Carbon.}}{3C_2} = \underset{\substack{\text{Potassium}\\\text{Bromide.}}}{2KBr} + \underset{\substack{\text{Carbon}\\\text{Monoxide.}}}{6CO}$$

POTASSII CARBONAS, U. S.—Potassium Carbonate. K_2CO_3; 137.27. *Sal Tartar.*—Should contain, when thoroughly dried, not less than 98 per cent. of pure Potassium Carbonate, $[CO(OK)_2]$. A white, granular powder; odorless; strongly alkaline taste; very deliquescent. Made by purifying pearlash, by dissolving it in *cold* water, filtering, evaporating, and granulating. Average dose, 1 Gm. (15 gr.).

POTASSII CHLORAS, U. S.—Potassium Chlorate. $KClO_3$; 121.68.—Should contain not less than 99 per cent. of pure Potassium Chlorate, $[ClO_2 . OK]$. Great caution should be observed in handling it, as dangerous explosions are liable to occur when it is heated or subjected to concussion or trituration with organic substances (cork, tannic acid, sugar, etc.), or with sulphur, antimony sulphide, phosphorus, or other easily oxidizable substances. Colorless, lustrous, monoclinic prisms or plates, or a white, granular powder; odorless; cooling, characteristic taste; permanent in the air. Average dose, 0.250 Gm. (4 gr.). Made by reacting on potassium chloride with calcium hypochlorite.

The rationale of the process is as follows: When solution of calcium hypochlorite is boiled, it is decomposed into calcium chlorate and chloride; and when calcium chlorate is heated with potassium chloride, double decomposition forms potassium chlorate and calcium chloride.

$$\text{1st.}\quad \underset{\substack{\text{Calcium}\\ \text{Hypochlorite.}}}{3Ca(OCl)_2} + \text{boiling} = \underset{\substack{\text{Calcium}\\ \text{Chloride.}}}{2CaCl_2} + \underset{\substack{\text{Calcium}\\ \text{Chlorate.}}}{Ca(O_3Cl)_2}.$$

$$\text{2d.}\quad \underset{\substack{\text{Calcium}\\ \text{Chlorate.}}}{Ca(O_3Cl)_2} + \underset{\substack{\text{Potassium}\\ \text{Chloride.}}}{2KCl} = \underset{\substack{\text{Potassium}\\ \text{Chlorate.}}}{2KClO_3} + \underset{\substack{\text{Calcium}\\ \text{Chloride.}}}{CaCl_2}.$$

Official Preparation.—Trochisci Potassii Chloratis.

POTASSII CITRAS, U. S.—Potassium Citrate. $K_3C_6H_5O_7 + H_2O$; 322.08. Should contain not less than 99 per cent. of pure Potassium Citrate, $[C_3H_4(OH)\ (COOK)_3 + H_2O]$. Transparent, prismatic crystals, or a white, granular powder; odorless; cooling, saline taste; deliquescent on exposure to air. Average dose, 1 Gm. (15 gr.). Made by decomposing potassium bicarbonate with citric acid, filtering, evaporating, and granulating.

$$\underset{\substack{\text{Potassium}\\ \text{Bicarbonate.}}}{3KHCO_3} + \underset{\text{Citric Acid.}}{H_3C_6H_5O_7} = \underset{\substack{\text{Potassium}\\ \text{Citrate.}}}{K_3C_6H_5O_7} + \underset{\text{Water.}}{3H_2O} + \underset{\substack{\text{Carbon}\\ \text{Dioxide.}}}{3CO_2}.$$

POTASSII CITRAS EFFERVESCENS, U. S.—Effervescent Potassium Citrate.—Potassium Citrate, 200 Gm.; Sodium Bicarb., 477 Gm.; Tartaric Acid, 252 Gm.; Citric Acid, 162 Gm. Dry the $K_3C_6H_5O_7$, powder, mix with the Citric and Tartaric Acid, then thoroughly incorporate the Sodium Bicarb. Dry between 93° and 104° C. (199.4° and 219.2° F.); when moist, granulate, then dry at 54° C. (129.2° F.). Average dose, 4 Gm. (60 gr.).

LIQUOR POTASSII CITRATIS, U. S.—Solution of Potassium Citrate.—An aqueous liquid containing in solution not less than 8 per cent. of anhydrous Potassium Citrate, $[C_3H_4(OH)(COOK)_3 = 304.2]$, with small amounts of citric and carbonic acids. Made by mixing together Potass. Bicarb. 8 Gm., Citric Acid 6 Gm., Distilled Water sufficient quantity to make 100 Cc. Average dose, 16 C[illegible]

Neutral Mixture.—A more agreeable preparation made by nearly saturating lemon juice with Potass. Bicarb. Official in U. S. P. of 1880 under name Mistura Potassii Citratis.

POTASSII CYANIDUM, U. S.—Potassium Cyanide. KCN; 64.70. Should contain not less than 95 per cent. of pure Potassium Cyanide. White, opaque, amorphous pieces, or a white, granular powder; odorless when perfectly dry; deliquescent in the air and exhaling the odor of hydrocyanic acid. Great caution should be used in tasting and handling this salt. Average dose, 0.010 Gm. (⅕ gr.). Made by fusing potassium ferrocyanide with potassium carbonate, separating the insoluble precipitate of metallic iron, and pouring the fused mass on a slab.

$$\underset{\text{Potassium Ferrocyanide.}}{K_4Fe(CN)_6} + \underset{\text{Potassium Carbonate.}}{K_2CO_3} = \underset{\text{Potassium Cyanide.}}{5KCN} + \underset{\text{Potassium Cyanate.}}{KOCN} + \underset{\text{Carbon Dioxide.}}{CO_2} + \underset{\text{Iron.}}{Fe.}$$

POTASSII DICHROMAS, U. S.—Potassium Dichromate. $K_2Cr_2O_7$ = 292.28. [Potassii Bichromas, Pharm. 1890.] Should contain not less than 99 per cent. of pure Potassium Dichromate, $[Cr_2O_5(OK)_2]$. Large, orange-red, transparent, triclinic prisms, or four-sided tabular crystals; odorless; acidulous, metallic taste; permanent in the air. Average dose, 0.010 Gm. (⅕ gr.). Made by treating potassium chromate, prepared from *chrome iron ore*, with sulphuric acid, evaporating, and crystallizing.

The ore is heated with potassium carbonate and chalk in contact with air, and the following reaction takes place:—

$$\underset{\text{Chrome Iron Ore.}}{2(FeOCr_2O_3)} + \underset{\text{Potassium Carbonate.}}{4K_2CO_3} + \underset{\text{Oxygen.}}{7O} =$$

$$\underset{\text{Potassium Chromate.}}{4(K_2CrO_4)} + \underset{\text{Ferric Oxide.}}{Fe_2O_3} + \underset{\text{Carbon Dioxide.}}{4CO_2;}$$

Then—

$$2(K_2CrO_4) + H_2SO_4 = K_2Cr_2O_7 + K_2SO + H_2O.$$

POTASSII ET SODII TARTRAS, U. S.—Potassium and Sodium Tartrate. *Rochelle Salt.* $KNaC_4H_4O_6 + 4H_2O$; 280.18.—Should contain not less than 99 per cent. of Pure Potassium and Sodium Tartrate, $[C_2H_2(OH)_2(COOK)(COONa) + 4H_2O]$. Colorless, transparent, rhombic prisms or a white powder; odorless, cooling, saline taste. The crystals slightly effloresce in dry air. Average dose, 8 Gm. (120 gr.). Made by treating solution of potassium bitartrate with sodium carbonate.

$$\underset{\text{Potassium Bitartrate.}}{2KHC_4H_4O_6} + \underset{\text{Sodium Carbonate.}}{Na_2CO_3} = \underset{\text{Potassium and Sodium Tartrate.}}{2KNaC_4H_4O_6} + \underset{\text{Water.}}{H_2O} + \underset{\text{Carbon Dioxide.}}{CO_2.}$$

POTASSII FERROCYANIDUM, U. S.—Potassium Ferrocyanide. $K_4Fe(CN)_6 + 3H_2O$; 419.62. Should contain not less than 99 per cent. of pure Potassium Ferrocyanide. Large, soft, transparent, yellow, four-sided, monoclinic tabular crystals or prisms; odorless, and having a mild, saline taste. Slightly efflorescent on exposure to the air. Average dose, 0.500 Gm. (7½ gr.). Made by treating nitrogenized substances (refuse animal matter) with crude pearlash, by which impure potassium cyanide is formed, lixiviating, and treating with freshly precipitated ferrous carbonate, which produces ferrocyanide of potassium, by the following reaction:—

$$\underset{\substack{\text{Potassium}\\\text{Cyanide.}}}{6KCN} + \underset{\substack{\text{Ferrous}\\\text{Carbonate.}}}{FeCO_3} = \underset{\substack{\text{Potassium}\\\text{Ferrocyanide.}}}{K_4Fe(CN)_6} + \underset{\substack{\text{Potassium}\\\text{Carbonate.}}}{K_2CO_3}.$$

POTASSII HYPOPHOSPHIS, U. S.—Potassium Hypophosphite. $KPH_2O_2 = 103.39$.—Should contain not less than 98 per cent. of pure Potassium Hypophosphite, [$PO . H_2OK$]. Caution: Explosion liable to occur when triturated or heated with nitrates, chlorates, or other oxidizing agents. White, opaque, hexagonal plates, or crystalline masses, or a granular powder; odorless; pungent, saline taste; very deliquescent. Average dose 0.500 Gm. (7½ gr.). Made by precipitating calcium hypophosphite with potassium carbonate, filtering, evaporating, and granulating, keeping it below 100° C. (212° F.) during the operation for fear of explosion.

$$\underset{\substack{\text{Calcium}\\\text{Hypophosphite.}}}{Ca2H_2PO_2} + \underset{\substack{\text{Potassium}\\\text{Carbonate.}}}{K_2CO_3} = \underset{\substack{\text{Potassium}\\\text{Hypophosphite.}}}{2KH_2PO_2} + \underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3}.$$

POTASSII IODIDUM, U. S.—Potassium Iodide. KI; 164.76.—Should contain not less than 99 per cent. of pure Potassium Iodide. Colorless, transparent, translucent, or opaque white cubical crystals, or a white, granular powder, having a peculiar, faint, iodine-like odor, pungent, saline, afterward bitter taste. Permanent in dry air, but slightly deliquescent in moist air. Average dose, 0.500 Gm. (7½ gr.). Made by treating solution of potassa with iodine, evaporating to dryness and heating with charcoal. The result is, the formation of two salts, Iodide and Iodate of Potassium:—

$$\underset{\substack{\text{Potassium}\\\text{Hydroxide.}}}{6KOH} + \underset{\text{Iodine.}}{(I_2)_3} = \underset{\substack{\text{Potassium}\\\text{Iodide.}}}{5KI} + \underset{\substack{\text{Potassium}\\\text{Iodate.}}}{KIO_3} + \underset{\text{Water.}}{3H_2O}.$$

By evaporating to dryness, the mixed salts are obtained, and by exposing to heat with charcoal, the iodate is deoxidized to iodide.

Official Preparation.—Unguentum Potassii Iodidi.

POTASSII NITRAS, U. S.—Potassium Nitrate (Nitre). KNO_3; 100.43.—Should contain not less than 99 per cent. of pure Potassium Nitrate [NO_2OK]. Colorless, transparent, six-sided, rhombic prisms, or a white, crystalline powder; odorless, cooling, pungent taste. Slightly hygroscopic in moist air. Average dose, 0.500 Gm. (7½ gr.). Usually a natural product; produced artificially, however, in what are known as *nitre beds*, consisting of earth, wood-ashes, animal and vegetable refuse. Ammonia is produced by d [illegible] is oxidized and nitric acid formed, which unites w [illegible] potassium nitrate results. This is [illegible] evaporation, and crystallization [illegible] petre.

POTASSII PERMANGANAS, U. S.—Potassium Permanganate. $KMnO_4$ = 156.98.—Should contain not less than 99 per cent. of pure Potassium Permanganate, $[MnO_3 . OK]$. When in concentrated solution or in the dry condition, should not be brought in contact with organic or other readily oxidizable substances. Slender, monoclinic prisms, of a dark purple color, almost opaque by transmitted light, and of a blue, metallic lustre by reflected light; odorless, and having a taste at first sweet, but afterward disagreeable and astringent. Average dose, 0.065 Gm. (1 gr.). Made by boiling a solution of potassium manganate with water.

$$\underset{\substack{\text{Potassium}\\ \text{Manganate.}}}{3K_2MnO_4} + \underset{\text{Water.}}{3H_2O} = \underset{\substack{\text{Potassium}\\ \text{Permanganate.}}}{2K_2Mn_2O_8} + \underset{\substack{\text{Manga-}\\ \text{nese Peroxide.}}}{Mn_3H_2} + \underset{\substack{\text{Potassium}\\ \text{Hydroxide.}}}{4KHO.}$$

The acid is used to neutralize the potassium hydrate liberated by the reaction, for in the presence of an excess of potassa, the permanganate otherwise remains in the condition of manganate.

POTASSII SULPHAS, U. S.—Potassium Sulphate. K_2SO_4; 173.07.—Should contain not less than 99 per cent. of pure Potassium Sulphate, $[SO_2(OK)_2]$. Hard, colorless, transparent, six-sided, rhombic prisms, terminated by pyramids, or a white powder; odorless and having a somewhat bitter, saline taste; permanent in the air. Average dose, 2 Gm. (30 gr.). Made by purifying the residue from nitric acid manufacture, also from other sources, as *Kainite*, the mineral found in the Stassfurt salt-beds, which is a double sulphate of potassium and magnesium.

It may be made directly at any time, by decomposing potassium nitrate with sulphuric acid.

$$\underset{\substack{\text{Potassium}\\ \text{Nitrate.}}}{2KNO_3} + \underset{\substack{\text{Sulphuric}\\ \text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Potassium}\\ \text{Sulphate.}}}{K_2SO_4} + \underset{\substack{\text{Nitric}\\ \text{Acid.}}}{2HNO_3.}$$

SODIUM. Na; 23.

The Salts of Sodium are generally more frequently used than those of Potassium, because they are relatively cheaper and often more soluble.

SODII HYDROXIDUM, U. S. Sodium Hydroxide. [Soda, Pharm. 1890. Caustic Soda. Sodium Hydrate.] It should contain not less than 90 per cent. of pure anhydrous Sodium Hydroxide, and not more than 2 per cent. of other inorganic substances, with the exception of water. May be prepared by oxidizing the metal by water, and evaporating.

LIQUOR SODII HYDROXIDI. Solution of Sodium Hydroxide. [Liquor Sodæ, Pharm. 1890.] An aqueous solution, containing about 5 per cent. of Sodium Hydroxide, $[NaOH = 39.76]$. A clear, colorless liquid; odorless; very acrid and caustic taste; strongly alkaline reaction. Made by dissolving 56 Gm. of Sodium Hydroxide in 944 Gm. of Distilled Water. Prepared in similar manner to Liq. Potass. Hydrox. Average dose, 1 Cc. (15 ♏).

SODII ACETAS, U. S.—Sodium Acetate. $NaC_2H_3O_2 + 3H_2O =$ 135.10.—Large, colorless, transparent, monoclinic prisms or a granular crystalline powder; efflorescent in warm dry air; odorless; saline, bitter taste; neutral or faintly alkaline reaction. Should contain in an uneffloresced condition not less than 99.5 per cent. of pure Sodium Acetate, $[CH_3 . COONa + 3H_2O]$. Average dose, 1 Gm. (15 gr.). Made by decomposing sodium carbonate with acetic acid.

$$\underset{\text{Acetic Acid.}}{2HC_2H_3O_2} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\text{Sodium Acetate.}}{2NaC_2H_3O_2} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

SODII ARSENAS, U. S.—Sodium Arsenate. $Na_2HAsO_4 + 7H_2O = 309.84$.—Should contain in an uneffloresced condition not less than 98 per cent. of pure Di-sodium-ortho-arsenate, $[AsO(OH)(ONa)_2 + 7H_2O]$. Colorless, transparent, monoclinic prisms, odorless, and having a mild, alkaline taste; caution should be used in tasting this salt, as it is very poisonous. Efflorescent in dry air, and somewhat deliquescent in moist air. Average dose, 0.005 Gm. (10 gr.). Made by heating together arsenious acid, sodium nitrate, and sodium carbonate.

The rationale of this process is, that when these three salts are fused together, sodium pyroarsenate is formed, while nitrous anhydride and carbon dioxide escape as gases.

$$\underset{\substack{\text{Arsenic}\\\text{Trioxide.}}}{As_2O_3} + \underset{\substack{\text{Sodium}\\\text{Nitrate.}}}{2NaNO_3} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Sodium}\\\text{Pyroarsenate.}}}{Na_4As_2O_7} + \underset{\substack{\text{Nitrous}\\\text{Anhydride.}}}{N_2O_3} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

The sodium pyroarsenate is then converted into orthoarsenate by dissolving the former in water, filtering and crystallizing. The orthoarsenate is the official salt.

$$\underset{\substack{\text{Sodium}\\\text{Pyroarsenate.}}}{Na_4AS_2O_7} + \underset{\text{Water.}}{15H_2O} = \underset{\text{Sodium Orthoarsenate.}}{2(Na_2HAsO_4,\ 7H_2O)}.$$

SODII ARSENAS EXSICCATUS, U. S.—Exsiccated Sodium Arsenate. $Na_2HAsO_4 = 184.68$.—Should contain not less than 98 per cent. of pure anhydrous Di-sodium-ortho-arsenate, $[AsO(OH)(ONa)_2]$. Prepared by drying the crystals at a temperature between 40° and 50° C., until disintegrated, then at 150° C. until they cease to lose weight. An amorphous white powder, odorless, and having a mildly alkaline taste. Average dose, 3 Mg. ($\frac{1}{20}$ gr.).

SODII BENZOAS, U. S.—Sodium Benzoate. $NaC_7H_5O_2$; 143.01.—Should contain not less than 99 per cent. of pure Sodium Benzoate, $[C_6H_5 . COONa]$. A white, amorphous, granular, or crystalline powder; odorless; sweetish, astringent taste; permanent in the air. Average dose, 1 Gm. (15 gr.). Made by decomposing sodium carbonate with benzoic acid.

$$\underset{\text{Benzoic Acid.}}{2HC_7H_5O_2} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Sodium}\\\text{Benzoate.}}}{2NaC_7H_5O_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} +$$

SODII BICARBONAS, U. S.—Sodium Bicarbonate
83.43.—Should contain not less than 99 per cent. of pure

bonate, [CO(OH)(ONa)]. A white, opaque powder, permanent in dry air, but slowly decomposed in moist air, odorless, cooling, mildly alkaline taste. Average dose, 1 Gm. (15 gr.). Made by washing commercial sodium bicarbonate with distilled water.

Official Preparation.—Trochisci Sodii Bicarbonatis.

Sodium bicarbonate is largely prepared by the ammonia-soda or Solvay's process.

SOLVAY'S PROCESS.—Carbon dioxide is passed into a solution of common salt in ammonia water, which results in a double decomposition. Sodium bicarbonate is precipitated and ammonium chloride remains in solution.

$$\underset{\substack{\text{Sodium}\\\text{Chloride.}}}{NaCl} + \underset{\text{Ammonia}}{NH_3} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O} = \underset{\substack{\text{Sodium}\\\text{Bicarbonate.}}}{HNaCO_3} + \underset{\substack{\text{Ammonium}\\\text{Chloride.}}}{NH_4Cl.}$$

SODII BISULPHIS, U. S.—Sodium Bisulphite. $NaHSO_3$ = 103.35.—Should contain not less than 90 per cent. of pure Sodium Bisulphite. Opaque, prismatic crystals, or a granular powder, exhaling an odor of sulphur dioxide, and having a disagreeable, sulphurous taste. Exposed to the air, the salt loses sulphur dioxide, and is gradually oxidized to sulphate. Average dose, 0.500 Gm. (7½ gr.). Made by saturating a solution of sodium carbonate with sulphurous acid.

$$\underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} + \underset{\substack{\text{Sulphurous}\\\text{Acid.}}}{2H_2SO_3} = \underset{\substack{\text{Sodium}\\\text{Bisulphite.}}}{2NaHSO_3} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O.}$$

SODII BORAS, U. S.—Sodium Borate. $Na_2B_4O_7 + 10H_2O$ = 379.32. (*Borax.*)—Should contain in an uneffloresced condition not less than 99 per cent. of pure Sodium tetraborate. Colorless, transparent, monoclinic prisms, or a white powder; odorless; sweetish alkaline taste; slightly efflorescent in dry air. Made by purifying the neutral salts, found in immense quantities in California, as a crystalline deposit in the blue mud of an offset of Clear Lake. It is sometimes, also, called biborate of sodium, and is found native in Thibet, Persia, etc. Another name given it is *Tincal.* Tuscany is also a source of borax, where it occurs, principally, as crude boric acid. Average dose, 0.500 Gm. (7½ gr.).

SODII BROMIDUM, U. S.—Sodium Bromide. NaBr; 102.24.—Should contain, when dried, not less than 97 per cent. of pure Sodium Bromide. Colorless, or white, cubical crystals, or a white granular powder; odorless; saline, slightly bitter, taste. The salt absorbs water from the air without deliquescing. Made by treating ferrous bromide with sodium carbonate. Average dose, 1 Gm. (15 gr.). The ferrous bromide is made by acting on iron wire with bromine, in the presence of water, and, after filtering, adding Na_2CO_3.

$$FeBr_2 + Na_2CO_3 = 2NaBr + FeCO_3.$$

SODII CARBONAS MONOHYDRATUS, U. S.—Monohydrated Sodium Carbonate. $Na_2CO_3 + H_2O$ = 123.19.—Should contain not less than 85 per cent. of pure anhydrous Sodium Carbonate, $[CO(ONa)_2]$, corresponding to not less than 99.5 per cent. of the crystallized monohydrated salt. A white, crystalline, granular powder, odorless, and having a strongly alkaline taste. When exposed to the air, under ordinary conditions, it absorbs only a slight percentage of moisture; exposed to warm, dry air at or above 50° C. (122° F.) the salt effloresces, and at 100° C. (212° F.) it loses its water of crystallization (14.52 per cent.). Average dose, 0.250 Gm. (4 gr.).

LEBLANC'S PROCESS.—Common salt is converted into sodium carbonate, in this process, by two steps.

First Step.—Salt is converted into sodium sulphate by sulphuric acid.

$$\underset{\substack{\text{Sodium}\\ \text{Chloride.}}}{2NaCl} + \underset{\substack{\text{Sulphuric}\\ \text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Sodium}\\ \text{Sulphate.}}}{Na_2SO_4} + \underset{\substack{\text{Hydrochloric}\\ \text{Acid.}}}{2HCl.}$$

Second Step.—The sodium sulphate, or *salt cake*, is decomposed by calcium carbonate and charcoal, at a high temperature, so as to yield sodium carbonate.

$$\underset{\substack{\text{Sodium}\\ \text{Sulphate.}}}{Na_2SO_4} + \underset{\substack{\text{Calcium}\\ \text{Carbonate.}}}{CaCO_3} + \underset{\text{Carbon.}}{C_4} = \underset{\substack{\text{Sodium}\\ \text{Carbonate.}}}{Na_2CO_3} + \underset{\substack{\text{Calcium}\\ \text{Sulphide.}}}{CaS} + \underset{\substack{\text{Carbon}\\ \text{Monoxide.}}}{4CO.}$$

The sulphate, first dried, is mixed with its own weight of limestone and half its weight of coal, and fused into a black mass. Sodium sulphate is converted by the coal into sodium sulphide, which reacts with the limestone (calcium carbonate), so as to form calcium sulphide and sodium carbonate. The black mass is now digested in warm water, which takes up the alkali and leaves the insoluble impurities, called soda waste, which is afterward used in the manufacture of sodium hyposulphite. By evaporating to dryness, a mass is obtained, which is calcined with sawdust, which converts the alkali—owing to the carbonic acid resulting from its combustion—fully into carbonate. Redissolving in water, and evaporating to dryness, gives the commercial salt. *Soda-ash* contains about 50 per cent. of sodium carbonate.

CRYOLITE PROCESS.—Largely used in the United States. Cryolite, which consists, mainly, of a double fluoride of aluminium and sodium ($Al_2F_6 . 6NaF$), is heated with chalk. Calcium fluoride is formed, while the sodium and aluminium combine to form sodium aluminate, which is dissolved out by lixiviation. The sodium aluminate is converted into carbonate by passing carbon dioxide, under pressure, through the solution. The alumina separates from the soda, becomes insoluble, and is deposited.

$$\underset{\text{Cryolite.}}{(Al_2F_6.6NaF)} + \underset{\substack{\text{Calcium}\\ \text{Carbonate.}}}{6CaCO_3} = \underset{\text{Sodium Aluminate.}}{Al_2O_3.3Na_2O} + \underset{\substack{\text{Calcium}\\ \text{Fluoride.}}}{6CaF_2} + \underset{\substack{\text{Carbon}\\ \text{Dioxide.}}}{6CO_2.}$$

SODII CHLORAS, U. S.—Sodium Chlorate. $NaClO_3 = 105.70$.—Should contain not less than 99 per cent. of pure Sodium Chlorate, [$ClO_2 . ONa$]. Caution: explosive when heated or triturated with organic substances or oxidizable substances. Colorless, transparent crystals (principally cubes with [illegible] facets), or a crystalline powder, permanent in dry [illegible] Average dose, 0.250 Gm. (4 [illegible] odium bitartrate and p [illegible]

The details of the process are as follows:—

First, acid sodium tartrate is prepared by decomposing sodium carbonate with tartaric acid.

$$\underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} + \underset{\substack{\text{Tartaric}\\\text{Acid.}}}{2H_2C_4H_4O_6} = \underset{\substack{\text{Acid Sodium}\\\text{Tartrate.}}}{2NaHC_4H_4O_6} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O.}$$

Then the acid sodium tartrate is added to the potassium chlorate:—

$$\underset{\substack{\text{Acid Sodium}\\\text{Tartrate.}}}{NaHC_4H_4O_6} + \underset{\substack{\text{Potassium}\\\text{Chlorate.}}}{KClO_3} = \underset{\substack{\text{Sodium}\\\text{Chlorate.}}}{NaClO_3} + \underset{\substack{\text{Acid Potassium}\\\text{Tartrate.}}}{KHC_4H_4O_6.}$$

SODII CHLORIDUM, U. S.—Sodium Chloride. $NaCl$; 58.06.—(*Common Salt.*)—Should contain, when dried, not less than 99 per cent. of pure Sodium Chloride. Colorless, transparent, cubical crystals or a white crystalline powder, permanent in dry air; odorless; purely saline taste. Obtained by evaporating sea water, and the salt from salt wells, springs, etc. Average dose, emetic, 16 Gm. (240 gr.).

SODII CITRAS, U. S. Sodium Citrate.—$2Na_3C_6H_5O_7 + 11H_2O =$ 709.20.—Should contain not less than 97 per cent. of pure Sodium Citrate, $[2C_3H_4(OH)(COONa)_3 + 11H_2O]$. A white, granular powder, odorless, and having a cooling, saline taste. It slowly effloresces on exposure to dry air. Prepared by adding sodium carbonate to a solution of citric acid until effervescence ceases, evaporating and granulating the product. Average dose, 1 Gm. (15 gr.).

SODII HYPOPHOSPHIS, U. S.—Sodium Hypophosphate. $NaPH_2O_2 + H_2O$; 105.29.—Should contain not less than 98 per cent. of pure Sodium Hypophosphite, $[PO.H_2ONa + H_2O]$. Caution: explosive when heated or triturated with oxidizing agents. Small, colorless, transparent, rectangular plates, of a pearly lustre, or a white, granular powder; odorless; bitterish-sweetish, saline taste; very deliquescent on exposure to the air. Average dose, 1 Gm. (15 gr.). Made by double decomposition between calcium hypophosphite and sodium carbonate.

$$\underset{\substack{\text{Calcium}\\\text{Hypophosphite.}}}{Ca2H_2PO_2} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Sodium}\\\text{Hypophosphite.}}}{2Na_2HPO_2} + \underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3.}$$

Sometimes this salt explodes with violence during evaporation; this was supposed to be due to the employment of too much heat, but it occurs at the heat of a water-bath. Evaporation should, therefore, be performed below 100° C. (212° F.).

$$\underset{\substack{\text{Sodium}\\\text{Hypophosphite.}}}{5NaH_2PO_2} = \underset{\substack{\text{Sodium}\\\text{Pyrophosphate.}}}{Na_4P_2O_7} + \underset{\substack{\text{Sodium}\\\text{Metaphosphate.}}}{NaPO_3} + \underset{\substack{\text{Phosphoretted}\\\text{Hydrogen.}}}{2PH_3} + \underset{\text{Hydrogen.}}{2H_2.}$$

Hydrogen and phosphoretted hydrogen are evolved, the latter being spontaneously inflammable.

Hypophosphorous acid is the acid present in this salt.

SODII IODIDUM, U. S.—Sodium Iodide. NaI; 148.78.—Should contain not less than 98 per cent. of pure Sodium Iodide. Colorless, cubical crystals, or a white crystalline powder; odorless; saline and slightly bitter taste; in moist air it deliquesces and frequently undergoes decomposition, the salt assuming a brown tint. Average dose, 0.560 Gm. (7½ gr.). Made by treating ferrous iodide with sodium carbonate.

$$\underset{\substack{\text{Ferrous}\\\text{Iodide.}}}{FeI_2} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Sodium}\\\text{Iodide.}}}{2NaI} + \underset{\substack{\text{Ferrous}\\\text{Carbonate.}}}{FeCO_3}.$$

SODII NITRAS, U. S.—Sodium Nitrate. $NaNO_3 = 84.45$. (*Cubic Nitre. Chili Saltpetre.*)—Should contain not less than 99 per cent. of pure Sodium Nitrate [$NO_2 . ONa$]. Found in Chili and Peru. Colorless, transparent, rhombohedral crystals; odorless; cooling, saline, and slightly bitter taste. Hygroscopic in moist air. Made by purifying the native salt. Average dose, 1 Gm. (15 gr.).

It is the cheapest source for obtaining nitrates.

SODII NITRIS, U. S.—Sodium Nitrite. $NaNO_2 = 68.57$.—Should contain not less than 90 per cent. of pure Sodium Nitrite, [$NO . ONa$]. White, opaque, fused masses or pencils, or colorless, transparent, hexagonal crystals; odorless, mild, saline taste. When exposed to the air, the salt deliquesces and is gradually oxidized to sodium nitrate, and becomes unfit for use. Average dose, 0.065 Gm. (1 gr.).

SODII PHENOLSULPHONAS, U. S.—Sodium Phenolsulphonate. $NaC_6H_5O_4S + H_2O + 230.45$. [Sodii Sulphocarbolas, Pharm. 1890.]—Should contain not less than 99 per cent. of pure Sodium Paraphenolsulphonate, [$C_6H_4(OH)SO_3Na\ 1:4 + 2H_2O$]. Colorless, transparent, rhombic prisms; odorless; cooling, saline, bitter taste; somewhat efflorescent in dry air. Average dose, 0.250 Gm. (4 gr.).

SODII PHOSPHAS, U. S.—Sodium Phosphate. $Na_2HPO_4 + 12H_2O = 355.61$.—Should contain, in an effloresced condition, not less than 99 per cent. of pure Di-sodium-ortho-phosphate, [$PO . (OH)(ONa)_2 + 12H_2O$]. Large, colorless, monoclinic prisms, or a granular, crystalline salt; odorless; cooling, saline taste. The crystals effloresce in the air, and gradually lose five molecules of their water of crystallization (25.1 per cent.). Average dose, 2 Gm. (30 gr.). Made by treating acid calcium phosphate with sodium carbonate. The details of the process are as follows:—

Acid calcium phosphate is made from bones, by treating them with sulphuric acid, after thorough calcination. To the concentrated liquid obtained by boiling this solution down, carbonate of sodium is added until the phosphoric acid is completely saturated. The liquid is then filtered and set aside to crystallize.

Details.—Bones consist of neutral calcium phosphate and animal matter. The latter is separated by burning them to whiteness, leaving a powder called bone phosphate or bone ash, associated with some calcium carbonate. When this is mixed with sulphuric acid, the calcium carbonate is decomposed, giving rise to effervescence. The calcium phosphate undergoes partial decomposition; the greater part of the lime being liberated, precipitates as calcium sulphate, while the phosphoric acid combines with the undecomposed portions of the phosphate, and remains in solution as an acid calcium phosphate, holding dissolved a small portion of calcium sulphate.

Ca_32PO_4	+	$2H_2SO_4$	=	CaH_42PO_4	+	$2CaSO_4$.
Calcium Phosphate.		Sulphuric Acid.		Acid Calcium Phosphate.		Calcium Sulphate.

"In order to separate the acid phosphate from the precipitated mass of calcium sulphate, boiling water is added to the mixture. The whole is strained, and the sulphate washed as long as acid phosphate is removed, which is known by the water passing through in an acid state. The different liquids which have passed the strainer, consisting of the solution of acid calcium phosphate, are mixed and allowed to stand, and, by cooling, a portion of calcium sulphate is deposited, which is got rid of by decantation. The bulk of the liquid is now reduced by evaporation, and, in consequence of the diminution of water, a fresh portion of calcium sulphate is deposited, which is separated by subsidence and decantation, as before. The acid calcium phosphate solution being heated, is now saturated by means of a hot solution of sodium carbonate, the carbonic acid is liberated with effervescence, and the alkali, combining with the excess of acid of the acid phosphate, produces sodium phosphate, while the acid calcium phosphate, by the loss of its excess of acid, becomes the neutral phosphate, and precipitates.

CaH_42PO_4	+	Na_2CO_3	=	$CaHPO_4$	+	Na_2HPO_4	+	H_2O	+	CO_2.
Acid Calcium Phosphate.		Sodium Carbonate.		Calcium Phosphate.		Sodium Phosphate.		Water.		Carbon Dioxide.

"The calcium phosphate is separated by filtration, and the filtered liquor which is a solution of sodium phosphate, is evaporated, so as to crystallize."—(Remington.)

SODII PHOSPHAS EFFERVESCENS, U. S. Effervescent Sodium Phosphate.—Exsiccated Sod. Phos., 200 Gm.; Sod. Bicarb., 477 Gm.; Tartaric Acid, 252 Gm.; Citric Acid, 162 Gm. To make about 1000 Gm. Powder the Citric Acid, and mix it intimately with the Ex. Sod. Phos. and Tart. Acid, then thoroughly incorporate the Sod. Bicarb. Heat to between 93° and 104° C. When moist, granulate through a No. 6 tinned iron sieve. Dry at not exceeding 54° C. Bottle tight. Average dose, 8 Gm. (120 gr.).

SODII PHOSPHAS EXSICCATUS, U. S. Exsiccated Sodium Phosphate. Should contain not less than 99 per cent. of pure anhydrous Sodium Phosphate, $[PO . (OH)(ONa)_2]$. A white powder which absorbs moisture readily, made by allowing the crystals of Sodium Phosphate to effloresce for several days in warm air, at a temperature of from 25° to 30° C., then drying in an oven at 100° C. until the salt ceases to lose weight. Average dose, 1 Gm. (15 gr.).

SODII PYROPHOSPHAS, U. S.—Sodium Pyrophosphate. $Na_4P_2O_7 + 10H_2O$; 443.02.—Should contain, in an uneffloresced cor dition, not less than 99 per cent. of pure Sodium Pyrophosphate, [(PO $(ONa)_4 + 10H_2O]$. Colorless, transparent, monoclinic pri crystalline powder. Odorless; cooling, saline and feebly a slightly efflorescent in warm air. Made by heating sodium phosphate to redness, dissolving and crystallizing.

SODII SALICYLAS, U. S.—Sodium Salicylate. $NaC_7H_5O_3$; 158.89.—Should contain not less than 99.5 per cent. of pure Sodium Salicylate, $[C_6H_4(OH)COONa]$. White, microcrystalline powder or scales, or an amorphous, colorless powder, or having not more than a faint pink tinge; odorless, and having a sweetish, saline taste. Average dose, 1 Gm. (15 gr.). Made by decomposing sodium carbonate with salicylic acid.

$$\underset{\text{Salicylic Acid.}}{2HC_7H_5O_3} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Sodium}\\\text{Salicylate.}}}{2NaC_7H_5O_3} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

SODII SULPHAS, U. S.—Sodium Sulphate. $Na_2SO_4 + 10H_2O$; 319.91. (*Glauber's Salt.*)—Should contain, in an uneffloresced condition, not less than 99 per cent. of pure Sodium Sulphate, $[SO_2(ONa)_2 + 10H_2O]$. Large, colorless, transparent, monoclinic prisms or granular crystals. Odorless; saline bitter taste. The salt effloresces rapidly in the air, and finally loses all of its water of crystallization. Average dose, 16 Gm. (240 gr.). Made by treating common salt with sulphuric acid.

SODII SULPHIS, U. S.—Sodium Sulphite. $Na_2SO_3 + 7H_2O$; 250.39.—Should contain, in the uneffloresced and air-dried condition, not less than 96 per cent. of pure Sodium Sulphite. Colorless, transparent, monoclinic prisms; odorless; cooling, saline, and sulphurous taste. Exposed to the air, the salt effloresces, and is slowly oxidized to sulphate. Average dose, 1 Gm. (15 gr.). Made by saturating a solution of sodium carbonate with SO_2 gas, thus forming acid sodium sulphite, to which is added an equal weight of sodium carbonate, which forms the neutral sulphite.

$$\underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} + \underset{\substack{\text{Sulphur}\\\text{Dioxide.}}}{SO_2} = \underset{\substack{\text{Sodium}\\\text{Sulphite.}}}{Na_2SO_3} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

SODII THIOSULPHAS, U. S.—Sodium Thiosulphate. $Na_2S_2O_3 + 5H_2O$; 246.46. [Sodium Hyposulphis, Pharm. 1890.] Should contain not less than 98 per cent. of pure Sodium Thiosulphate. Colorless, transparent, monoclinic prisms. Permanent in the air below 33° C. (91.4° F.), but efflorescent in dry air above that temperature; slightly deliquescent in moist air; odorless; cooling, somewhat bitter taste; neutral reaction. Made by decomposing calcium thiosulphate with sodium sulphate. Average dose, 1 Gm. (15 gr.).

$$\underset{\substack{\text{Calcium}\\\text{Thiosulphate.}}}{CaS_2O_3} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4} = \underset{\substack{\text{Sodium}\\\text{Thiosulphate.}}}{Na_2S_2O_3} + \underset{\substack{\text{Calcium}\\\text{Sulphate.}}}{CaSO_4}.$$

LITHIUM. Li = 6.98.

LITHII BENZOAS, U. S.—Lithium Benzoate. $LiC_7H_5O_2$ = [illegible] —Should contain not less than 98.5 per cent. of pure Lithium [illegible] H. . COOLi]. A light, white powder, or small, shining, [illegible] odorless, or having a faintly benzoin-like odor; cooling and sweetish taste; permanent in the air. Average dose, 1 Gm. (15 gr.). Made by treating lithium carbonate with benzoic acid.

$$\underset{\substack{\text{Lithium}\\\text{Carbonate.}}}{Li_2CO_3} + \underset{\substack{\text{Benzoic}\\\text{Acid.}}}{2HC_7H_5O_2} = \underset{\substack{\text{Lithium}\\\text{Benzoate.}}}{2LiC_7H_5O_2} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

LITHII BROMIDUM, U. S.—Lithium Bromide. $LiBr = 86.34$.—Should contain, when well dried, not less than 97 per cent. of pure Lithium Bromide. A white, granular salt; odorless; sharp, somewhat bitter taste; very deliquescent. Made by decomposing ferrous bromide with lithium carbonate. Average dose, 1 Gm. (15 gr.).

$$\underset{\substack{\text{Ferrous}\\\text{Bromide.}}}{FeBr_2} + \underset{\substack{\text{Lithium}\\\text{Carbonate.}}}{Li_2CO_3} = \underset{\substack{\text{Lithium}\\\text{Bromide.}}}{2LiBr} + \underset{\substack{\text{Ferrous}\\\text{Carbonate.}}}{FeCO_3}.$$

LITHII CARBONAS, U. S.—Lithium Carbonate. $Li_2CO_3 = 73.51$.—Should contain not less than 98.5 per cent. of pure Lithium Carbonate $[CO.(OLi)_2]$. A light, white powder; odorless; alkaline taste; permanent in the air. Made by precipitating lithium sulphate with ammonium carbonate. Average dose, 0.500 Gm. (7½ gr.).

LITHII CITRAS, U. S.—Lithium Citrate. $Li_3C_6H_5O_7 + 4H_2O = 280.08$.—Should, when carefully dried, contain not less than 98.5 per cent. of pure Lithium Citrate, $[C_3H_4(OH)(COOLi)_3]$. A white powder or colorless crystals; odorless; cooling, faintly alkaline taste; deliquescent on exposure to moist air. Average dose, 0.500 Gm. (7½ gr.). Made by decomposing the carbonate with citric acid.

$$\underset{\substack{\text{Lithium}\\\text{Carbonate.}}}{3Li_2CO_3} + \underset{\text{Citric Acid.}}{2H_3C_6H_5O_7} = \underset{\substack{\text{Lithium}\\\text{Citrate.}}}{2Li_3C_6H_5O_7} + \underset{\text{Water.}}{3H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{3CO_2}.$$

LITHII CITRAS EFFERVESCENS, U. S.—Effervescent Lithium Citrate.—Made by mixing 195 Gm. of Citric Acid (uneffloresced crystals) with 50 Gm. of Lithium Citrate and 300 Gm. of Tartaric Acid (dried and powdered), then thoroughly incorporating therewith 570 Gm. of dried and powdered Sodium Bicarbonate; drying in an oven at 93°–94° C. (199.4°–219.2° F.); and, when the mixture has acquired a moist consistency, granulating. Average dose, 8 Gm. (120 gr.).

LITHII SALICYLAS, U. S.—Lithium Salicylate. $LiC_7H_5O_3 = 142.99$.—Should contain not less than 98.5 per cent. of pure Lithium Salicylate, $[C_6H_4(OH)COOLi]$. A white, or grayish white powder; odorless; sweetish taste; deliquescent in a moist atmosphere. Average dose, 1 Gm. (15 gr.). Made by decomposing lithium carbonate with salicylic acid.

$$\underset{\substack{\text{Lithium}\\\text{Carbonate.}}}{Li_2CO_3} + \underset{\substack{\text{Salicylic}\\\text{Acid.}}}{2HC_7H_5O_3} = \underset{\substack{\text{Lithium}\\\text{Salicylate.}}}{2LiC_7H_5O_3} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

AMMONIUM.

AQUA AMMONIÆ, U. S.—Ammonia Water.—A colorless, transparent liquid; very pungent characteristic odor; acrid, alkaline taste;

strongly alkaline reaction, consisting of an aqueous solution of ammonia [NH_3 = 16.93] containing 10 per cent. by weight of the gas. Made by mixing ammonium chloride with milk of lime, and distilling over the gas into distilled water. The reaction is as follows:—

$$\underset{\substack{\text{Ammonium}\\\text{Chloride.}}}{2NH_4Cl} + \underset{\substack{\text{Calcium}\\\text{Hydroxide.}}}{Ca(HO)_2} = \underset{\text{Ammonia.}}{2NH_3} + \underset{\substack{\text{Calcium}\\\text{Chloride.}}}{CaCl_2} + \underset{\text{Water.}}{2H_2O.}$$

AQUA AMMONIÆ FORTIOR, U. S.—Stronger Ammonia Water.—28 per cent. by weight aqueous solution NH_3. Sp. gr. 0.897, at 25° C. (77° F.).

SPIRITUS AMMONIÆ, U. S.—Spirit of Ammonia.—An alcoholic solution of ammonia containing 10 per cent. by weight of the gas.

SPIRITUS AMMONIÆ AROMATICUS, U. S.—Aromatic Spirit of Ammonia.—An aromatic hydro-alcoholic solution of ammonium carbonate. (See Spiritus, Part II.)

LIQUOR AMMONII ACETATIS, U. S.—Solution of Ammonium Acetate. (*Spirit of Mindererus.*)—An aqueous solution of Ammonium Acetate, [$CH_3 . COONH_4$ = 76.51], containing about 7 per cent. of the salt, together with small amounts of acetic and carbonic acid. A clear, colorless liquid, free from empyreuma; mildly saline taste; acid reaction. Made by mixing solution of acetic acid and ammonium carbonate.

$$\underset{\substack{\text{Acid Ammonium Carbonate}\\\text{and Carbamate.}}}{(NH_4HCO_3)NH_4NH_2CO_2} + \underset{\text{Acetic Acid.}}{3HC_2H_3O_2} =$$

$$\underset{\substack{\text{Ammonium}\\\text{Acetate.}}}{3NH_4C_2H_3O_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{2CO_2} + \underset{\text{Water.}}{H_2O.}$$

AMMONII BENZOAS, U. S.—Ammonium Benzoate. $NH_4C_7H_5O_2$; 138.06.—It should contain not less than 98 per cent. of pure Ammonium Benzoate, [$C_6H_5 . COONH_4$], and should be kept in well-stoppered bottles. Thin, white, laminar crystals, or a crystalline powder, gradually losing ammonia on exposure to the air; odorless; saline, bitter, afterward slightly acrid taste. Average dose, 1 Gm. (15 gr.). Made by dissolving benzoic acid in water of ammonia.

$$\underset{\substack{\text{Benzoic}\\\text{Acid.}}}{HC_7H_5O_2} + \underset{\substack{\text{Ammonia}\\\text{Water.}}}{NH_4HO} = \underset{\substack{\text{Ammonium}\\\text{Benzoate.}}}{NH_4C_7H_5O_2} + \underset{\text{Water.}}{H_2O.}$$

AMMONII BROMIDUM, U. S.—Ammonium Bromide. NH_4Br; 97.29.—It should contain not less than 97 per cent. of pure Ammonium Bromide, and should be kept in well-stoppered bottles. Colorless, transparent, prismatic crystals, or a white crystalline powder permanent in the air; odorless, pungent. s[illegible] [illegible] -dding water of ammonia, gradually, to bro[illegible] [illegible])

$$\underset{\text{Bromine}}{6Br} \quad [illegible]$$

AMMONII CARBONAS, U. S.—Ammonium Carbonate. $C_2H_{11}N_3O_5$ = 156.01.—It should contain not less than 97 per cent. of a mixture of Acid Ammonium Carbonate, [$CO(OH)ONH_4$], and Ammonium Carbamate, [$CO(NH_2)ONH_4$], and should yield not less than 31.58 per cent. of ammonia gas. For dispensing purposes, only the translucent portion should be used. White, hard, translucent, striated masses, having a strong odor of ammonia without empyreuma, and a sharp, saline taste. On exposure to the air, the salt loses both ammonia and carbon dioxide, becoming opaque, and is finally converted into friable, porous lumps, or a white powder (acid ammonium carbonate). Average dose, 0.250 Gm. (4 gr.). Made by subliming a mixture of ammonium sulphate and calcium carbonate.

$$\underset{\text{Ammonium Chloride.}}{2(NH_4)_2SO_4} + \underset{\text{Calcium Carbonate.}}{2CaCO_3} = \underset{\text{Ammonium Carbonate. (Official.)}}{NH_4HCO_3.NH_4NH_2CO_2} +$$

$$\underset{\text{Water.}}{H_2O.} + \underset{\text{Ammonia.}}{NH_3} + \underset{\text{Calcium Sulphate.}}{2CaSO_4}$$

AMMONII CHLORIDUM, U. S.—Ammonium Chloride. NH_4Cl = 53.11. (*Sal Ammoniac, Muriate of Ammonia.*)—It should contain not less than 99.5 per cent. of pure Ammonium Chloride. A white, crystalline powder, permanent in the air; odorless; cooling, saline taste; aqueous solution has a neutral reaction. Made by subliming a mixture of ammonium sulphate and sodium chloride.

This salt is chiefly made from the gas liquor from gas works.

AMMONII IODIDUM, U. S.—Ammonium Iodide. NH_4I = 143.83.—It should contain not less than 97 per cent. of pure Ammonium Iodide. When deeply colored, the salt should not be dispensed, but it may be deprived of free iodin by adding to its concentrated aqueous solution sufficient ammonium sulphide T. S. to render it colorless, then filtering, and evaporating on a water-bath to dryness. Minute, colorless, cubical crystals, or a white, granular powder, without odor when colorless, but emitting a slight odor of iodine when colored, and having a sharp, saline taste. The salt is very hygroscopic, and soon becomes yellow or yellowish-brown on exposure to the air and light, owing to the loss of ammonia and the liberation of iodine. Average dose, 0.250 Gm. (4 gr.). Made by mixing solutions of potassium iodide and ammonium sulphate.

$$\underset{\text{Potassium Iodide.}}{2KI} + \underset{\text{Ammonium Sulphate.}}{(NH_4)_2SO_4} = \underset{\text{Ammonium Iodide.}}{2NH_4I} + \underset{\text{Potassium Sulphate.}}{K_2SO_4.}$$

AMMONII SALICYLAS, U. S. Ammonium Salicylate. $NH_4C_7H_5O_3$ = 153.94.—It should contain not less than 98 per cent. of pure Ammonium Salicylate, [$C_6H_4(OH)COONH_4$], and should be kept in well-stoppered bottles protected from heat and light. Colorless, lustrous, monoclinic prisms, or plates, or a white, crystalline powder; odorless, and having at first a slightly saline, bitter taste, with a sweetish after-taste. Made by adding salicylic acid to ammonia water, evapor *ing and crystallizing* Average dose, 0.250 Gm. = 250 Mg. (4 gr

AMMONII VALERAS, U. S.—Ammonium Valerianate. $NH_4C_5H_9O_2$; 118.24. [Ammonii Valerianas, Pharm. 1890.]—Colorless or white quadrangular plates, deliquescent in moist air; valerianic acid odor; sharp and sweetish taste. It should contain not less than 98 per cent. of pure Ammonium Valerianate, $[C_4H_9COONH_4]$, and should be kept in well-stoppered bottles. Made by passing ammonia gas into monohydrated valerianic acid.

The salt found in commerce is, usually, the acid salt, and should be neutralized with ammonia when used in solution for making preparations.

MAGNESIUM, CALCIUM, BARIUM, AND STRONTIUM.

MAGNESIUM. Mg; 24.18.

MAGNESII CARBONAS, U. S.—Magnesium Carbonate. Approximately $(MgCO_3)_4 . Mg(OH)_2 . 5H_2O$; 482.26.—Should yield, upon ignition, not less than 40 per cent. of residue, of which not less than 96 per cent. should consist of pure magnesium oxide. Light, white friable masses, or a bulky, white powder; odorless; slightly earthy taste; permanent in the air. Average dose, 3 Gm. (45 gr.). Made by double decomposition between magnesium sulphate and sodium carbonate. Boiling distilled water is used to make the heavy, U. S. salt. The light variety results when cold water is employed.

$$\underset{\substack{\text{Magnesium}\\\text{Sulphate.}}}{5MgSO_4} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{5Na_2CO_3} + \underset{\text{Water.}}{H_2O} =$$

$$\underset{\text{Magnesium Carbonate.}}{4MgCO_3Mg(HO)_2} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{5Na_2SO_4} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

MAGNESII OXIDUM, U. S.—Magnesium Oxide. Magnesia. MgO; 40.26. [Magnesia, Pharm. 1890. Calcined Magnesia, Light Magnesia.] Should contain, after ignition, not less than 96 per cent. of pure Magnesium Oxide. A white, very bulky and very fine powder, slowly absorbing moisture and carbon dioxide from the air; odorless; an earthy, but no saline, taste; faintly alkaline reaction when moistened with water. Made by calcining light magnesium carbonate.

$$\underset{\text{Magnesium Carbonate.}}{(MgCO_3)_4.Mg(HO)_2} + 5H_2O = \underset{\text{Magnesia}}{5MgO} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{4CO_2} + \underset{\text{Water.}}{6H_2O}.$$

MAGNESII OXIDUM PONDEROSUM, U. S.—Heavy Magnesium Oxide. Heavy Magnesia. [Magnesia Ponderosa, Pharm. 1890.] MgO; 40.06.—Should contain, after ignition, not less than 96 per cent. of pure Magnesium Oxide. A white, dense and very fine powder, which should conform to the reaction and tests of *Magnesii Oxidum.* Average dose. 2 Gm. (30 gr.). Made by calcining heavy magnesium carbonate.

II SULPHAS, U. S.—Magnesium Sulphate. $MgSO_4$ +
(*Epsom Salt.*)—Should contain not less than 99.7 per
sium Sulphate, $[SO_2 . O_2Mg + 7H_2O]$. Small, col-
dles or rhombic prisms; odorless; cooling, saline

and bitter taste; slowly efflorescent in the air. Made by treating native magnesium hydrate with sulphuric acid.

Native magnesium hydrate is found in the United States, and is a silicious hydrate, practically free from lime. The mineral is treated with the acid, dried, and calcined, in order to convert into red oxide any ferrous sulphate which may be present. It is then dissolved in water, and calcium sulphide added to separate any remaining portion of iron. Purified by recrystallization.

Dolomite, the double carbonate of magnesium and calcium, is used in England for preparing Epsom salts. The carbon dioxide is driven off by heat, converting the residue into hydrates, which are treated with HCl. The calcium chloride formed by this reaction is dissolved out from the magnesium salt with water, and the latter converted into sulphate by treating it with sulphuric acid.

MAGNESII SULPHAS EFFERVESCENS, U. S.—Effervescent Magnesium Sulphate.—Dry 500 Gm. of Magnesium Sulphate, mix it with 136 Gm. of Citric Acid, and 211 Gm. of Tartaric Acid, and thoroughly incorporate with it 403 Gm. of Sodium Bicarbonate, heat to 98°–104° C. (199.4°–219.2° F.), and when the mixture has acquired a moist consistency, granulate, and dry at not exceeding 54° C. (129.2° F.). Average dose, 16 Gm. (240 gr.).

LIQUOR MAGNESII CITRATIS, U. S.—Solution of Magnesium Citrate.—Made by dissolving magnesium carbonate 15 Gm. in a solution of citric acid (33 Gm. Water of S.), flavoring with Syr. Cit. Acid, 60 Cc., bottling (capacity of bottle 360 Cc.), and dropping into bottle Potass. Bicarb. 2.5 Gm.; cork tightly, shake till P. B. is dissolved.

CALCIUM. Ca; 39.8.

CALX, U. S.—Lime. Calcium Oxide. CaO; 55.68.—Hard, white or grayish-white masses, which, in contact with the air, gradually attract moisture and carbon dioxide, and fall to a white powder; odorless; caustic taste. Made by calcining white marble, or the purest varieties of native calcium carbonate, and containing, when in the anhydrous state, not less than 90 per cent. of pure Calcium Oxide.

LIQUOR CALCIS, U. S.—Lime Water. Solution of Calcium Hydroxide.—A clear, colorless liquid; odorless; alkaline taste; alkaline reaction. Made by dissolving lime in water. Contains about 0.14 per cent. of pure Calcium Hydroxide, [$Ca(OH)_2$]. Varies with temperature.

CALX SULPHURATA, U. S.—Sulphurated Lime.—A pale gray powder, exhaling a faint odor of hydrogen sulphide, having a nauseous and alkaline taste, gradually decomposing by exposure to moist air. A mixture containing at least 60 per cent. of calcium sulphide (CaS; 71.63), together with unchanged calcium sulphate ($CaSO_4$; 135.15), and carbon, in varying proportions. Made by heating dried cal
sulphate, charcoal, and starch to bright redness until the mixt
lost its black color, cooling, powdering, and transferring the
small, glass-stoppered vials. Average dose, 0.065 Gm. (1

CALCII BROMIDUM, U. S.—Calcium Bromide. $CaBr_2$; 198.52. —It should contain not less than 97 per cent. of pure Calcium Bromide. A white, granular salt; very deliquescent; odorless; sharp saline taste. Average dose, 1 Gm. (15 gr.). Made by dissolving calcium carbonate in hydrobromic acid.

$$\underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3} + \underset{\substack{\text{Hydrobromic}\\\text{Acid.}}}{2HBr} = \underset{\substack{\text{Calcium}\\\text{Bromide.}}}{CaBr_2} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2}.$$

CALCII CARBONAS PRÆCIPITATUS, U. S.—Precipitated Calcium Carbonate. $CaCO_3$; 99.35.—Should contain not less than 99 per cent. of pure Calcium Carbonate. A fine, white powder, permanent in the air; odorless and tasteless. Average dose, 1 Gm. (15 gr.). Made by double decomposition between calcium chloride and sodium carbonate.

$$\underset{\substack{\text{Calcium}\\\text{Chloride.}}}{CaCl_2} + \underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3} + \underset{\substack{\text{Sodium}\\\text{Chloride.}}}{2NaCl}.$$

Precipitated calcium carbonate is also known as Precipitated Chalk.

CRETA PRÆPARATA, U. S.—Prepared Chalk (Drop Chalk).—Native CalciumCarbonate, freed from most of its impurities by elutriation. A white to grayish white, very fine, amorphous powder, often molded into conical drops, permanent in the air; odorless and tasteless. Average dose, 1 Gm. (15 gr.).

Mistura Cretæ, Pulvis Cretæ Compositus, see Part II.

CALCII CHLORIDUM, U. S.—Calcium Chloride. $CaCl_2$; 110.16. —Calcium Chloride, rendered anhydrous by fusion at the lowest possible temperature. Should contain not less than 99 per cent. of pure calcium chloride. White, slightly translucent, hard fragments, very deliquescent; odorless; sharp, saline taste; neutral, or faintly alkaline reaction. Made by acting on calcium carbonate with hydrochloric acid.

$$\underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3} + \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{2HCl} = \underset{\substack{\text{Calcium}\\\text{Chloride.}}}{CaCl_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2} + \underset{\text{Water.}}{H_2O}.$$

CALCII HYPOPHOSPHIS, U. S.—Calcium Hypophosphite. $Ca(PH_2O_2)_2$; 168.86.—Should contain not less than 98 per cent. Calcium Hypophosphite, $[(PO.OH_2)_2Ca]$. Caution: liable to explode when triturated or heated with nitrates, chlorates, or other oxidizing agents. Colorless, transparent, monoclinic prisms, or small, lustrous scales, or a white, crystalline powder, permanent in dry air; odorless; nauseous, bitter taste. Average dose, 0.500 Gm. (7½ gr.). Made by heating phosphorus with milk of lime.

$$\underset{\text{Phosphorus.}}{8P} + \underset{\substack{\text{Calcium}\\\text{Hydrate.}}}{3Ca(HO)_2} + \underset{\text{Water.}}{6H_2O} = \underset{\substack{\text{Calcium}\\\text{Hypophosphite.}}}{3CaH_4(PO_2)_2} + \underset{\substack{\text{Phosphoretted}\\\text{Hydrogen.}}}{2PH_3}.$$

It is necessary to provide for the safe escape of the phosphoretted hydrogen gas evolved in this reaction, by conducting it, by a hood, into draught. No higher heat than 85° C. (185° F.) should be explosion.

CALCII PHOSPHAS PRÆCIPITATUS, U. S.—Precipitated Calcium Phosphate. $Ca_3(PO_4)_2$; 307.98.—Should contain not less than 99 per cent. of pure Calcium Phosphate, $[(PO . O_3)_2Ca_3]$. A bulky, white, amorphous powder, permanent in the air; odorless and tasteless. Average dose, 1 Gm. (15 gr.). Made by treating bone ash with HCl, and precipitating it with ammonia.

See also Syrupus Hypophosphitum, Syrupus Hypophosphitum Compositus, Syrupus Calcii Lactophosphatis, and Syrupus Calcis, under Syrupi, Part II.

CALCII SULPHAS EXSICCATUS, U. S.—Exsiccated Calcium Sulphate. (*Dried Gypsum.*)—A powder containing about 95 per cent., by weight, of Calcium Sulphate ($CaSO_4$; 135.15), and about 5 per cent. of Water; prepared from the purer varieties of native gypsum ($CaSO_4 + 2H_2O$; 170.91), by carefully heating until about three-fourths of the water has been expelled. Occurring as a fine, white powder, without odor or taste. Keep dry.

For Syrupus Calcis, Linimentum Calcis, Syrupus Hypophosphitum, Syrupus Hypophosphitum Compositus, Syrupus Calcii Lactophosphatis, Pulvis Cretæ Compositus, Mistura Cretæ, see under appropriate heads in Part I.

BARIUM. Ba; 136.4.

This element furnishes to the Pharmacopœia one salt, used for testing, and two test-solutions.

STRONTIUM. Sr; 86.94.

STRONTII BROMIDUM, U. S.—Strontium Bromide. $SrBr_2 + 6H_2O$; 352.94.—Should contain not less than 97 per cent. of pure Strontium Bromide. Colorless, transparent, hexagonal crystals; odorless, and having a bitter, saline taste. Very deliquescent. Average dose, 1 Gm. (15 gr.). Made by dissolving the carbonate in hydrobromic acid, evaporating and crystallizing.

STRONTII IODIDUM, U. S.—Strontium Iodide. $SrI_2 + 6H_2O =$ 446.02.—Colorless, transparent, hexagonal plates; odorless, and having a bitter, saline taste. Deliquescent, and colored yellow by exposure to light and air. Average dose, 0.500 Gm. (7½ gr.). Made by evaporating a solution of strontium hydroxide in hydriodic acid.

STRONTII SALICYLAS, U. S.—Strontium Salicylate.—$Sr(C_7H_5O_3)_2 + 2H_2O = 394.72$. Should contain not less than 98.5 per cent. of pure Strontium Salicylate, $[(C_6H_4 . OH . COO)_2Sr + 2H_2O]$. A white, crystalline powder; odorless, and having a sweetish, saline taste. Average dose, 1 Gm. (15 gr.). Made by decomposing strontium with a strong hot solution of salicylic acid, filtering and crystallizing.

ZINC, ALUMINIUM, CERIUM AND CADMIUM.

ZINCUM.—ZINC. Zn; 64.9.

ZINCUM, U. S.—Zinc. Zn = 64.9.—Should contain not
99 per cent. of pure metallic zinc. A bluish-white metal,

crystalline fracture; in the form of thin sheets, or in irregular granular pieces, or moulded into thin pencils, or in fine powder. Prepared by roasting calamine (impure carbonate) with charcoal, and collecting the zinc vapors in water. Used in making H and in preparing the Zn salts.

ZINCI ACETAS, U. S.—Zinc Acetate. $Zn(C_2H_3O_2)_2 + 2H_2O = 217.82$.—Should contain, in the uneffloresced condition, not less than 99.5 per cent. of pure zinc acetate, $[(CH_3 . COO)_2Zn + 2H_2O]$. Soft, white, six-sided, monoclinic plates, of a pearly lustre, gradually efflorescing in dry air, and losing some of its acid; faintly acetous odor, and in dilute solution an astringent, metallic taste; acid reaction. Average dose, 0.125 Gm. (2 gr.). Made by heating zinc oxide with acetic acid.

$$\underset{\text{Zinc Oxide.}}{ZnO_2} + \underset{\text{Acetic Acid.}}{2HC_2H_3O_2} = \underset{\text{Zinc Acetate.}}{Zn(C_2H_3O_2)_2} + \underset{\text{Water.}}{H_2O}.$$

ZINCI BROMIDUM, U. S.—Zinc Bromide. $ZnBr_2 = 223.62$.—Should contain, when anhydrous, at least 97 per cent. of pure Zinc Bromide. A white, granular powder, very deliquescent; odorless, sharp, saline, and metallic taste; slightly acid reaction. Average dose, 0.125 Gm. (2 gr.). Made by double decomposition of zinc sulphate and potassium bromide.

$$\underset{\substack{\text{Zinc}\\\text{Sulphate.}}}{ZnSO_4} + \underset{\substack{\text{Potassium}\\\text{Bromide.}}}{2KBr} = \underset{\substack{\text{Zinc}\\\text{Bromide.}}}{ZnBr_2} + \underset{\substack{\text{Potassium}\\\text{Sulphate.}}}{K_2SO_4}.$$

ZINCI CARBONAS PRÆCIPITATUS, U. S.—Precipitated Zinc Carbonate.—Hydrous Zinc Carbonate, which, upon ignition, should yield not less than 72 per cent. of zinc oxide, $[ZnO = 80.78]$. An impalpable white powder, of somewhat variable chemical composition; permanent in the air; odorless and tasteless. Made by double decomposition of zinc sulphate and sodium carbonate.

$$\underset{\substack{\text{Sodium}\\\text{Carbonate.}}}{5Na_2CO_3} + \underset{\substack{\text{Zinc}\\\text{Sulphate.}}}{5ZnSO_4} + \underset{\text{Water.}}{3H_2O} =$$

$$\underset{\text{Zinc Carbonate.}}{(ZnCO_3)_2 3Zn(HO)_2} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{5Na_2SO_4} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{3CO_2}.$$

Conduct at boiling heat, to prevent loss by the action of the CO_2 on the neutral carbonate, which occurs if cold solutions are used.

ZINCI CHLORIDUM, U. S.—Zinc Chloride. $ZnCl_2$; 135.26.—Should contain, when anhydrous, not less than 99.5 per cent. of pure Zinc Chloride. A white granular powder, or porcelain-like masses, irregular, or moulded into pencils, very deliquescent; odorless; of such intensely caustic properties as to make tasting dangerous, unless the salt be dissolved in much water; the dilute solution has an astringent metallic taste. Acid reaction. Made by evaporating the official solution of chloride of zinc.

$$+ \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{4HCl} = \underset{\substack{\text{Zinc}\\\text{Chloride.}}}{2ZnCl_2} + \underset{\text{Hydrogen.}}{4H}.$$

LIQUOR ZINCI CHLORIDI, U. S.—Solution of Zinc Chloride. (*Burnett's Disinfecting Fluid.*)—An aqueous solution of $ZnCl_2$ containing about 50 per cent. of the salt. Made by heating zinc with hydrochloric acid.

$$\underset{\text{Zinc.}}{2Zn} + \underset{\text{Hydrochloric Acid.}}{4HCl} = \underset{\text{Zinc Chloride.}}{2ZnCl_2} + \underset{\text{Hydrogen.}}{4H.}$$

ZINCI IODIDUM, U. S.—Zinc Iodide. ZnI_2; 316.70.—Should contain, when anhydrous, not less than 98 per cent. of pure zinc iodide. A white, granular powder; odorless; sharp, saline and metallic taste; very deliquescent, and upon exposure to air and light becoming brown from liberated iodine; acid reaction. Average dose, 0.065 Gm. (1 gr.). Made by digesting zinc with iodine diffused in water.

$$\underset{\text{Zinc.}}{Zn} + \underset{\text{Hydriodic Acid.}}{2HI} = ZnI_2 + 2H.$$

ZINCI OXIDUM, U. S.—Zinc Oxide. ZnO; 80.78.—Should contain not less than 99.5 per cent. of pure Zinc Oxide. A very fine, amorphous, white or yellowish-white powder, free from gritty particles, without odor or taste; it gradually absorbs carbon dioxide from the air. Made by calcining zinc carbonate. Average dose, 0.250 Gm. (4 gr.).

On the large scale, this salt is made by heating calamine and coal together, and separating the impurities by blowing the mixed vapors up a large tower, allowing the heavier particles to subside, and then by a powerful draught blowing outside into a room containing muslin bags, where it is deposited. It may be prepared by exposing the precip. carbonate to a low red heat until the water and carbonic acid are wholly expelled.

ZINCI PHENOLSULPHONAS, U. S.—Zinc Phenolsulphonate. $Zn(C_6H_5O_4S)_2 + 8H_2O = 551.56$. (*Zinc Sulphocarbolate.*)—Should contain, in uneffloresced crystals, not less than 99.5 per cent. of pure Zinc Paraphenolsulphonate [$(C_6H_4(OH)SO_3)_2Zn$ 1 : 4 + $8H_2O$]. Colorless, transparent, rhombic prisms or tabular crystals; odorless, and having an astringent, metallic taste. Exposed to the air the salt effloresces, and upon exposure to light and air may become slightly pink. Average dose, 0.125 Gm. (2 gr.).

ZINCI STEARAS, U. S.—Zinc Stearate.—A very fine, white powder, tasteless, and having a very faint odor, resembling that of fat. Made by adding a solution of 75 Gm. of Zn Acetate in 5000 Cc. of water to a solution of 200 Gm. of dried Castile Soap in 3000 Cc. of hot water. The latter solution must be cold before mixing. The precipitate is washed and dried without heat.

ZINCI SULPHAS, U. S.—Zinc Sulphate. $ZnSO_4 + 7H_2O$; 285.41. Should contain, in uneffloresced crystals, not less than 99.5 per cent. of pure Zinc Sulphate, [$SO . O_2Zn + 7H_2O$]. Colorless, transparent rhombic crystals; odorless; astringent metallic taste; efflorescent in dry air; acid reaction. Made by acting on zinc with diluted sulphu acid.

$$\underset{\text{Zinc.}}{2Zn} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} + \underset{\text{Water.}}{H_2O} = \underset{\substack{\text{Zinc}\\\text{Sulphate.}}}{2ZnSO_4} + \underset{\text{Hydrogen.}}{4H} + \underset{\text{Water.}}{H_2O.}$$

ZINCI VALERIAS, U. S.—Zinc Valerate. $Zn(C_5H_9O_2)_2 + 2H_2O = 301.28$.—[*Zinci Valerianas*, Pharm. 1890.]—Should contain not less than 99 per cent. of pure Zinc Valerate, $[(C_4H_9 . COO)_2Zn + 2H_2O]$. White, pearly scales, having the odor of valeric acid, and a sweetish, astringent, and metallic taste; acid reaction. On exposure to the air, it slowly loses valeric acid. Average dose, 0.125 Gm. (2 gr.). Made by double decomposition of zinc sulphate and sodium valerianate.

$$\underset{\substack{\text{Sodium}\\\text{Valerate.}}}{2NaC_5H_9O_2} + \underset{\substack{\text{Zinc}\\\text{Sulphate.}}}{ZnSO_4} = \underset{\substack{\text{Zinc}\\\text{Valerate.}}}{Zn(C_5H_9O_2)_2} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4.}$$

ALUMINUM. Al; 26.9.

ALUMEN, U. S.—Alum. (*Potassium Alum. Aluminum and Potassium Sulphate.*) $AlK(SO_4)_2 + 12H_2O$; 471.02.—Large, colorless, octahedral crystals, sometimes modified by cubes, or in crystalline fragments; odorless; sweetish, strongly astringent taste. Made by treating alum-clay (chiefly aluminum silicate) with sulphuric acid and potassium sulphate.

ALUMEN EXSICCATUM, U. S.—Exsiccated Alum. (*Dried Alum.*) $AlK(SO_4)_2 = 256.46$.—Should contain not less than 99.5 per cent. of pure Aluminium and Potassium Sulphate. Average dose, 0.500 Gm. (7½ gr.). A white, granular powder, attracting moisture when exposed to the air; odorless; sweetish, astringent taste. Prepared by driving off the water of crystallization from alum.

ALUMINI HYDROXIDUM, U. S.—Aluminum Hydroxide. [Alumini Hydras, Pharm. 1890.] (*Hydrated Alumina.*)—A white, light, amorphous powder, odorless and tasteless; permanent in dry air. Made by double decomposition of alum and sodium carbonate.

ALUMINI SULPHAS, U. S.—Aluminum Sulphate. $Al_2(SO_4)_3 . 16H_2O$; 625.93.—A white, crystalline powder, or shining plates, or crystalline fragments, permanent in the air; odorless; sweetish, and afterward astringent taste. Made by treating aluminum hydrate with sulphuric acid and crystallizing.

CERIUM. Ce; 139.2.

CERII OXALAS, U. S.—Cerium Oxalate.—A fine white powder, without odor or taste, permanent in the air. Consists chiefly of a mixture of the oxalates of cerium, didymium, and lanthanum, and of other rare earths of this group. Average dose, 0.065 Gm. (1 gr.)

CADMIUM. Cd; 111.6.

s into no official preparations, though it is used to some

MANGANESE, IRON AND CHROMIUM.

MANGANESE. Mn; 54.6.

MANGANI DIOXIDUM PRÆCIPITATUM, U. S.—Precipitated Manganese Dioxide. [To replace Mangani Dioxidum, Pharm. 1890.] Chiefly Manganese Dioxide, [$MnO_2 = 86.36$], with small amounts of other oxides of manganese, corresponding to not less than 80 per cent. of Manganese Dioxide. A heavy, very fine, black powder, without odor or taste; permanent in the air. Average dose, 0.250 Gm. (4 gr.).

MANGANI HYPOPHOSPHIS, U. S.—Manganese Hypophosphite. $Mn(PH_2O_2)_2 + H_2O = 201.54$. Shotld contain not less than 97 per cent. of pure Manganese Hypophosphite, [$(PH_2O \cdot O)_2Mn + H_2O$]. A pink crystalline powder, odorless, and nearly tasteless; permanent in the air. Average dose, 0.200 Gm. (3 gr.).

MANGANI SULPHAS, U. S.—Manganese Sulphate. $MnSO_4 + 4H_2O$; 221.47.—Should contain not less than 99.5 per cent. of pure Manganese Sulphate, [$SO_2 \cdot O_2Mn + 4H_2O$]. Colorless, or pale rose-colored, translucent, tetragonal prisms; odorless; slightly bitter and astringent taste. Made by Prof. Diehl's process. Manganese dioxide and charcoal are heated together to redness, the residue treated with sulphuric acid and again heated to redness, and the residue dissolved in water. The solution is then filtered and crystallized.

POTASSII PERMANGANAS, U. S.—Potassium Permanganate. (See Potassium.)

IRON.

FERRUM, U. S.—Iron. $Fe = 55.5$. Metallic iron, in the form of fine, bright, and non-elastic wire.

FERRUM REDUCTUM, U. S.—Reduced Iron.—Should contain not less than 90 per cent. of pure metallic iron. The U. S. P. gives process of assay. A very fine, grayish-black, lustreless powder, permanent in dry air; without odor or taste. Average dose, 0.065 Gm. (1 gr.). Made by passing hydrogen over subcarbonate of iron, heated in a reduction tube.

The subcarbonate directed in the U. S. P. process is more properly an oxyhydrate, and the H combines with the O to form water, and metallic iron in fine powder is left behind.

$$\begin{array}{ccccccc} Fe_2O_3 & + & 6H & = & 2Fe & + & 3H_2O. \\ \text{Ferric Oxide.} & & \text{Hydrogen.} & & \text{Iron.} & & \text{Water.} \end{array}$$

FERRI CARBONAS SACCHARATUS, U. S.—Saccharated Ferrous Carbonate.—Should contain not less than 15 per cent. of [$FeCO_3 = 115.05$]. A greenish-gray powder, gradually oxidized by contact with air; odorless; at first a sweetish, afterward a slightly ferruginous taste; neutral reaction. Average dose, 0.250 Gm. (4 gr.). Made by double decomposition between ferrous sulphate and sodium bicarbonate. precipitate is preserved with sugar.

$$\underset{\substack{\text{Ferrous}\\ \text{Sulphate.}}}{FeSO_4} + \underset{\substack{\text{Sodium}\\ \text{Bicarbonate.}}}{2NaHCO_3} = \underset{\substack{\text{Sodium}\\ \text{Sulphate.}}}{Na_2SO_4} + \underset{\substack{\text{Ferrous}\\ \text{Carbonate.}}}{FeCO_3} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\ \text{Dioxide.}}}{CO_2}.$$

MASSA FERRI CARBONATIS, U. S.—Mass of Ferrous Carbonate. (*Vallet's Mass.*)—Prepared by double decomposition between ferrous sulphate and sodium carbonate. The precipitate is preserved with honey, which prevents the ferrous carbonate from oxidizing.

$$\underset{\substack{\text{Ferrous}\\ \text{Sulphate.}}}{FeSO_4} + \underset{\substack{\text{Sodium}\\ \text{Carbonate.}}}{Na_2CO_3} = \underset{\substack{\text{Ferrous}\\ \text{Carbonate.}}}{FeCO_3} + \underset{\substack{\text{Sodium}\\ \text{Sulphate.}}}{Na_2SO_4}.$$

PILULÆ FERRI CARBONATUS, U. S.—Pills of Ferrous Carbonate.—Prepared by double decomposition between ferrous sulphate and potassium carbonate. The carbonate is preserved with sugar, but, to insure its presence, the Pharmacopœia directs that the pills should be freshly prepared when wanted. (See Pilulæ, Part II.)

MISTURA FERRI COMPOSITA. Compound Iron Mixture. (*Griffith's Mixture.*) Contains ferrous carbonate made by double decomposition between ferrous sulphate and potassium carbonate. The carbonate is preserved to a certain extent by the sugar in the mixture, but the preparation should be freshly made when wanted. (See Misturæ, Part II.)

FERRI CHLORIDUM, U. S.—Ferric Chloride.—Should contain not less than 22 per cent. of metallic iron in the form of chloride. Orange-yellow, crystalline pieces, very deliquescent in moist air; odorless, or having a faint odor of hydrochloric acid; strongly styptic taste. Made from Solution of Ferric Chloride. Average dose, 0.065 Gm. (1 gr.).

LIQUOR FERRI CHLORIDI, U. S.—Solution of Ferric Chloride. (*Solution of Ferric Chloride.*)—A reddish-brown liquid, consisting of an aqueous solution (with some free hydrochloric acid) of ferric chloride (Fe_2Cl_6) containing not less than 29 per cent. of the anhydrous salt, corresponding to 10 per cent. of metallic iron. It has a faint odor of hydrochloric acid; acid, strongly styptic taste; acid reaction. Prepared by oxidizing solution of ferrous chloride with nitric acid. Made by acting on iron with hydrochloric acid which converts it into ferrous chloride, $FeCl_2$, which is converted into ferric chloride (Fe_2C_6) by the addition of nitric and hydrochloric acids. The reaction is as follows:—

First Reaction.—

$$\underset{\text{Iron.}}{Fe_2} + \underset{\substack{\text{Hydrochloric}\\ \text{Acid.}}}{4HCl} = \underset{\substack{\text{Ferrous}\\ \text{Chloride.}}}{(FeCl_2)_2} + \underset{\text{Hydrogen.}}{4H}.$$

Second Reaction.—Conversion of ferrous chloride into ferric chloride.

$$\underset{\substack{\text{Ferrous}\\ \text{Chloride.}}}{6FeCl_2} + \underset{\substack{\text{Hydrochloric}\\ \text{Acid.}}}{6HCl} + \underset{\substack{\text{Nitric}\\ \text{Acid.}}}{2HNO_3} = \underset{\substack{\text{Ferric}\\ \text{Chloride.}}}{6Fe_2Cl_6} + \underset{\substack{\text{Nitrogen}\\ \text{Dioxide.}}}{N_2O_2} + \underset{\text{Water.}}{4H_2O}.$$

FERRI CITRAS, U. S.—Ferric Citrate.—Should contain Ferric te corresponding in amount to not less than 16 per cent. of metallic n, transparent, garnet-red scales; odorless; slightly ferruginous taste; acid reaction. Average dose, 0.250 Gm. (4 gr.). Prepared by evaporating and scaling solution of ferric citrate.

FERRI ET AMMONII CITRAS, U. S.—Iron and Ammonium Citrate. (*Ammonio-Ferric Citrate. Soluble Ferric Citrate.*)—Should contain Iron and Am. Cit. corresponding in amount to not less than 16 per cent. of metallic iron. Thin, transparent, garnet-red scales, deliquescent on exposure to damp air; odorless; saline, mildly ferruginous taste; neutral reaction. Prepared by adding water of ammonia to solution of ferric citrate, evaporating and scaling. Average dose, 0.250 Gm. (4 gr.).

FERRI ET QUININÆ CITRAS, U. S.—Iron and Quinine Citrate. —Should contain not less than 11.5 per cent. of dried quinin, and ferric citrate corresponding in amount to not less than 13.5 per cent. of metallic iron. The U. S. P. gives two processes of assay, one for quinine, and one for iron. Thin, transparent scales, of a reddish-brown color; odorless; bitter, mildly ferruginous taste; slowly deliquescent; acid reaction. Average dose, 0.250 Gm. (4 gr.). Made by dissolving quinine (alkaloid) in solution of ferric citrate, evaporating and scaling.

FERRI ET QUININÆ CITRAS SOLUBILIS, U. S.—Soluble Iron and Quinine Citrate.—Should contain same amount of quinine and iron as Fer. et quin. cit. Thin, transparent scales of a greenish, golden-yellow color; odorless, bitter, mildly ferruginous taste; deliquescent. Average dose, 0.025 Gm. (4 gr.). Made by adding to a solution of citrate of iron, quinine and citric acid, previously dissolved in distilled water, then adding sufficient ammonia water to precipitate and redissolve, evaporating and scaling on plates of glass.

FERRI ET STRYCHNINÆ CITRAS, U. S.—Iron and Strychnine Citrate.—Should contain not less than 0.9 nor more than 1 per cent. of strychnine, and ferric citrate corresponding in amount to not less than 16 per cent. of metallic iron. Thin, transparent scales, varying in color from garnet-red to yellowish brown; odorless; bitter and slightly ferruginous taste; deliquescent in damp air; slightly acid reaction. The U. S. P. gives two processes of assay, one for strychnine and one for iron. Average dose, 0.125 Gm. (2 gr.). Made by adding to a solution of citrate of iron and ammonium, citric acid and strychnine, and scaling.

FERRI ET AMMONII SULPHAS, U. S.— Ferric Ammonium Sulphate. $Fe(NH_4)(SO_4)_2 . 12H_2O$; 478.69. (*Ammonio-Ferric Sulphate. Ammonio-Ferric Alum.*)—Should contain, in the uneffloresced condition, 99.5 per cent. of pure Fer. Am. Sulph., and not less than 11.5 per cent. of metallic iron. Pale-violet, octahedral crystals, efflorescent on exposure to air; odorless; acid, styptic taste; slightly acid reaction. Average dose, 0.500 Gm. (7½ gr.). Prepared by dissolving sulphate of ammonium in solution of tersulphate of iron, evaporating and crystallizing.

$$\underset{\text{Ferric Sulphate.}}{Fe_2 3SO_4} + \underset{\substack{\text{Ammonium}\\ \text{Sulphate.}}}{(NH_4)_2SO_4} = \underset{\text{Ammonio-Ferric Sulphate.}}{2FeNH_4(SO_4)_2.}$$

FERRI ET AMMONII TARTRAS, U. S.—Iron and Ammonium Tartrate. (*Ammonio-Ferric Tartrate.*)—Should contain Fer. et Am. Tart. corresponding in amount to not less than 13 per cent. of metallic iron. Thin, transparent scales, varying in color from garnet-red to yellowish brown, only slightly deliquescent; odorless; sweetish and slightly ferruginous taste; neutral reaction. Prepared by dissolving ferric hydrate in solution of acid ammonium tartrate, and scaling. Average dose, 0.250 Gm. (4 gr.).

FERRI ET POTASSII TARTRAS, U. S.—Iron and Potassium Tartrate. (*Potassio-Ferric Tartrate.*)—Should contain Fer. et Pot. Tart. corresponding in amount to not less than 15 per cent. of metallic iron. Thin, transparent scales, varying in color from garnet-red to reddish-brown; odorless; sweetish, slightly ferruginous taste; slightly deliquescent in the air. Average dose, 0.250 Gm. (4 gr.). Prepared by adding to ferric hydrate acid potassium tartrate and a trace of water of ammonia, and scaling.

"*Boule de Mars,*" an olive-shaped ball of Ferri et Potassii Tartras, devised by the French. When a mild chalybeate drink is required the ball is suspended in a glass of water until the necessary quantity is dissolved to constitute a dose.

FERRI HYDROXIDUM, U. S.—Ferric Hydroxide. (*Ferric Hydrate. Hydrated Oxide of Iron.*)—$Fe(OH)_3$; 106.14. [Ferri Oxidum Hydratum, Pharm. 1890.]—Frequently used as an antidote for arsenic, and prepared by adding water of ammonia to solution of ferric sulphate, collecting and washing the precipitate. The reaction is as follows:

$$\underset{\substack{\text{Ferric}\\\text{Sulphate.}}}{Fe_2 3SO_4} + \underset{\substack{\text{Ammonium}\\\text{Hydroxide.}}}{6NH_4HO} = \underset{\substack{\text{Ferric}\\\text{Hydroxide.}}}{Fe_2(HO)_6} + \underset{\substack{\text{Ammonium}\\\text{Sulphate.}}}{3(NH_4)_2SO_4.}$$

The reaction occurs when it is used as an antidote as follows:—

$$\underset{\substack{\text{Ferric}\\\text{Hydrate.}}}{2Fe_2(HO)_6} + \underset{\substack{\text{Arsenic}\\\text{Trioxide.}}}{As_2O_3} = \underset{\substack{\text{Ferrous}\\\text{Arsenate.}}}{Fe_3(AsO_4)_2} + \underset{\substack{\text{Ferrous}\\\text{Hydrate.}}}{Fe(HO)_2} + \underset{\text{Water.}}{5H_2O.}$$

Hydrated oxide of iron should not be retained for any length of time on hand, because it decomposes even when kept under water. The ingredients, however, should always be ready for immediate use, weighed out in suitable bottles, and kept in an accessible and well-known place, ready for instant use in case of emergency.

FERRI HYDROXIDUM CUM MAGNESII OXIDO, U. S.—Ferric Hydroxide with Magnesium Oxide. [Ferri Oxidum Hydratum cum Magnesia, Pharm. 1890.] (*Arsenic Antidote.*)—Solution of Ferric Sulphate 40 Cc.; Magnesia 10 Gm.; Water, a sufficient quantity. Mix the solution of ferric sulphate with 125 Cc. of Water, and keep the liquid in a large, well-stoppered bottle. Rub the Magnesium Oxide with cold Water to a smooth and thin mixture, transfer this to a bottle capable of holding about 1000 Cc., and fill it with Water to about three-fourths of its capacity. When the preparation is wanted for use shake the Magnesium Oxide mixture to a homogeneous, thin magma, add it gradually to the diluted solution of Ferric Sulphate, and shake them together until a uniform, smooth mixture results. The two mixtures should be kept on hand for immediate use. Average dose, arsenical antidote, 120 Cc. (4 fl. oz.).

This preparation is to be preferred to the above as an antidote for arsenic, as it is not necessary to wash the precipitate, and the reaction that occurs leaves in solution sulphate of magnesium, which acts as a cathartic and carries off the ferrous arsenate formed. The two mixtures should always be kept on hand for immediate use. Average dose, arsenical antidote, 120 Cc. (4 fl. oz.).

FERRI HYPOPHOSPHIS, U. S.—Ferric Hypophosphite. $Fe(PH_2O_2)_3$; 249.09.—Should contain not less than 98 per cent. of pure Ferric Hypophosphite. $[(PH_2O \, . \, O)_3Fe.]$ A white, or grayish-white powder; odorless; nearly tasteless; permanent in the air. Average dose, 0.200 Gm. (3 gr.). Made by double decomposition between calcium hypophosphite and ferrous sulphate. On evaporation, the resulting ferrous hypophosphite is changed to ferric hypophosphite. This is one of the hypophosphites recommended by Dr. Churchill in the treatment of phthisis:—

$$\underset{\substack{\text{Calcium}\\ \text{Hypophosphite.}}}{Ca(H_2PO_2)_2} = \underset{\substack{\text{Ferrous}\\ \text{Sulphate.}}}{FeSO_4} + \underset{\substack{\text{Calcium}\\ \text{Sulphate.}}}{CaSO_4} + \underset{\substack{\text{Ferrous}\\ \text{Hypophosphite.}}}{Fe(H_2PO_2)_2.}$$

FERRI PHOSPHAS SOLUBILIS, U. S.—Soluble Ferric Phosphate.—Should contain Ferric Phosphate corresponding in amount to not less than 12 per cent. of metallic iron. Thin, bright green, transparent scales, permanent in dry air when excluded from light, but when unprotected, soon becomes dark and discolored; odorless; acidulous, slightly saline taste; slightly acid reaction. Average dose, 0.250 Gm. (4 gr.). Prepared by mixing solution of citrate of iron and phosphate of sodium, evaporating in scales.

This is not a definite chemical compound, but is sometimes termed sodio-ferric citro-phosphate, and greatly resembles the official ferric pyrophosphate. It is a scaled salt, and quite different from the insoluble slate-colored powder of phosphate of iron, formerly official.

FERRI PYROPHOSPHAS SOLUBILIS, U. S.—Soluble Ferric Pyrophosphate.—Thin, green, transparent scales; odorless; acidulous, slightly saline taste; permanent in dry air when excluded from light, but when unprotected, soon becomes discolored; slightly acid reaction. Average dose, 0.250 Gm. (4 gr.). Made by mixing solutions of citrate of iron and pyrophosphate of sodium, evaporating in scales.

The compound is a mixture of several salts, and not a definite chemical compound. It consists of sodio-ferric pyrophosphate, sodio-ferric citrate, and ferric citrate. It differs from the salt official in 1870, which was an insoluble ferric phosphate, $Fe_{4}3P_2O_7$, dissolved in solution of ammonium citrate.

FERRI SULPHAS, U. S.—Ferrous Sulphate. $FeSO_4$ +
276.01.—Should contain not less than 99.5 per cent. of p
Sulphate, $[SO_2 \, . \, O_2Fe + 7H_2O]$; the crystals should not
Large, pale bluish-green, monoclinic prisms, effloresce

odorless; saline, styptic taste; acid reaction. Average dose, 0.200 Gm. (3 gr.). Made by treating iron with diluted sulphuric acid, evaporating and crystallizing:—

$$\underset{\text{Iron.}}{Fe_2} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} = \underset{\substack{\text{Ferrous}\\\text{Sulphate.}}}{2FeSO_4} + \underset{\text{Hydrogen.}}{4H.}$$

FERRI SULPHAS EXSICCATUS, U. S.—Dried Ferrous Sulphate.—A grayish-white powder prepared by exsiccating 100 Gm. of ferrous sulphate at a temperature about 40° C. (104° F.), and still containing about 15 per cent. water of crystallization; and then heating on water-bath, constantly stirring, until the product weighs from 64 to 65 Gm. Powder, and bottle tightly. Three grains represent about five grains of the crystals. Average dose, 0.125 Gm. (2 gr.).

FERRI SULPHAS GRANULATUS, U. S.—Granulated Ferrous Sulphate. [Ferri Sulphas Præcipitatus, Pharm. 1880.] $FeSO_47H_2O$; 276.01.—A very pale bluish-green, crystalline powder, efflorescent in dry air, but when in contact with moisture, becoming gradually oxidized; odorless; saline, styptic taste; acid reaction. Made by precipitating an aqueous solution of ferrous sulphate with alcohol. Average dose, 0.200 Gm. (3 gr.).

LIQUOR FERRI SUBSULPHATIS, U. S.—Solution of Ferric Subsulphate. (*Solution of Basic Ferric Sulphate. Monsel's Solution.*) —An aqueous solution of variable chemical composition containing an amount of basic ferric sulphate corresponding to not less than 13.57 per cent. of metallic iron. It is a dark reddish-brown liquid; sp. gr. 1.548 at 25° C. (77° F.); odorless, or nearly so; acid, strongly styptic taste; acid reaction. Made by heating ferrous sulphate in a mixture of sulphuric and nitric acid.

LIQUOR FERRI TERSULPHATIS, U. S.—Solution of Ferric Sulphate.—An aqueous solution which should contain about 38 per cent. of normal Ferric Sulphate, $[Fe_2(SO_2.O_2)_3 = 397.05]$, corresponding to not less than 10 per cent. of metallic iron. It is a dark reddish-brown liquid; sp. gr. about 1.432 at 25° C. (77° F.); almost odorless; acid, strongly styptic taste; acid reaction. Made by heating ferrous sulphate in a mixture of nitric acid with excess of sulphuric acid.

This solution differs from the solution of subsulphate of iron merely in containing a larger proportion of sulphuric acid. It is a solution of the *true* persulphate $Fe_2(SO_4)_3$, or normal ferric sulphate. Solution of persulphate of iron is the name under which Monsel's solution is erroneously prescribed. The latter is a solution of a subsalt, $Fe_4O(SO_4)_5$. The reaction is as follows:—

$$\underset{\substack{\text{Ferrous}\\\text{Sulphate.}}}{6FeSO_4} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{3H_2SO_4} + \underset{\substack{\text{Nitric}\\\text{Acid.}}}{2HNO_3} = \underset{\substack{\text{Ferric}\\\text{Sulphate.}}}{3Fe_23SO_4} + \underset{\substack{\text{Nitrogen}\\\text{Dioxide.}}}{2NO} + \underset{\text{Water.}}{4H_2O.}$$

CHROMIUM. Cr; 51.7.

IDUM.—Chromium Trioxide. $CrO_3 = 99.34$.
iarm. 1890.] (*Chromic Acid. Chromic Anhy-*

drid.)—It should contain not less than 90 per cent. of pure Chromium Trioxide (chromic acid anhydride). Small, needle-shaped crystals or rhombic prisms of a dark purplish-red color and a metallic lustre; deliquescent in moist air, destructive to animal and vegetable tissues; odorless. Made by decomposing potassium bichromate with sulphuric acid.

$$\underset{\substack{\text{Potassium}\\\text{Bichromate.}}}{K_2Cr_2O_7} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} = \underset{\substack{\text{Chromium}\\\text{Trioxide.}}}{2CrO_3} + \underset{\substack{\text{Potassium}\\\text{Acid Sulphate.}}}{2KHSO_4} + \underset{\text{Water.}}{H_2O.}$$

POTASSII DICHROMAS, U. S.—Potassium Dichromate. (See under Potassium.)

NICKEL, COBALT, AND TIN.

Ni; 58.3. Co; 58.56. Sn; 118.1.

There are no official preparations of these metals. None of the unofficial salts of cobalt are of pharmaceutical interest. Tin and nickel are of great importance in the arts.

LEAD, COPPER, SILVER, AND MERCURY.

LEAD. Pb (Plumbum); 205.35.

Lead is obtained by roasting the native sulphide, *Galena*. It is a heavy, soft, bluish metal, with a sp. gr. of 11.45.

Lead and its compounds are poisonous; and as this metal is used to a large extent in the manufacture of water-pipes, the effect of water on lead is of interest. Pure water is a solvent of lead to a certain extent, owing to the formation of a slightly soluble hydroxide or carbonate. The purer the water the more dangerous it is in this way. If traces of sulphates or chlorides be present in the water, however, an insoluble coating is formed on the surface of the metal, which protects it from further decomposition.

PLUMBI ACETAS, U. S.—Lead Acetate. $Pb(C_2H_3O_2)_2 + 3H_2O$; 376.15. (*Sugar of Lead.*)—Should contain not less than 99.5 per cent. of pure Lead Acetate, $[(CH_3 . COO)_2Pb + 3H_2O]$. Colorless, shining, transparent, monoclinic prisms or plates, or heavy, white, crystalline masses, or in granular crystals, faintly acetous color; sweetish, astringent, afterward metallic taste. Efflorescent, and absorbing carbon dioxide, on exposure to the air. Average dose, 0.065 Gm. (1 gr.). Made by heating lead oxide with acetic acid, evaporating and crystallizing:—

$$\underset{\text{Lead Oxide.}}{PbO} + \underset{\text{Acetic Acid.}}{2HC_2H_3O_2} = \underset{\text{Lead Acetate.}}{Pb(C_3H_3O_2)_2} + \underset{\text{Water.}}{H_2O.}$$

The commercial salt is unfit for use, because it usually contains carbonate and oxide of lead.

LIQUOR PLUMBI SUBACETATIS, U. S.—Solution of Lead Subacetate. (*Goulard's Extract.*)—An aqueous liquid, which should contain in solution not less than 25 per cent. of Lead Subacetate (approximately $Pb_2O(CH_2COO_2)_2$; 543.74). It is a clear, colorless liquid;

odorless; having a sweetish, astringent taste and an alkaline reaction; sp. gr. 1.235 at 25° C. (77° F.). Made by boiling solution of lead acetate with lead oxide.

The subacetate is not a definite salt, but as found in official solutions it is a mixture of oxyacetates, produced by boiling the normal acetate in water in contact with the oxide. The following reaction occurs:—

$$\underset{\text{Lead Oxide.}}{3PbO} + \underset{\text{Lead Acetate.}}{3(Pb_2C_2H_3O_2)}.$$

$$\underbrace{Pb_3O(C_2H_3O_2)_4 + Pb_3O_2(C_2H_3O_2)_2}_{\text{Lead Oxyacetates.}}.$$

LIQUOR PLUMBI SUBACETATIS DILUTUS, U. S.—Diluted Solution of Lead Subacetate. (*Lead-Water.*)—Made by diluting 40 Cc. of solution of subacetate of lead with sufficient distilled water to make 1000 Cc.

The opalescence of lead-water is due to the formation of a trace of carbonate if the distilled water used has not been recently freed from carbonic acid gas by boiling and cooling it. A few drops of acetic acid will clear it, however; but it should be dispensed opalescent, to distinguish it from lime-water, for which it has often been mistaken, with serious results.

PLUMBI IODIDUM, U. S.—Lead Iodide. PbI_2; 457.15. Should contain not less than 99 per cent. of pure Lead Iodide. A heavy, bright yellow powder, odorless; tasteless; permanent in the air. Made by double decomposition between lead nitrate and potassium iodide:—

$$\underset{\substack{\text{Potassium}\\\text{Iodide.}}}{2KI} + \underset{\substack{\text{Lead}\\\text{Nitrate.}}}{Pb2NO_3} = \underset{\substack{\text{Lead}\\\text{Iodide.}}}{PbI_2} + \underset{\substack{\text{Potassium}\\\text{Nitrate.}}}{2KNO_3}.$$

PLUMBI NITRAS, U. S.—Lead Nitrate. $Pb(NO_3)_2$; 328.49.—Should contain not less than 99.5 per cent. of pure Lead Nitrate $[(NO_2 . O)_2Pb]$. Colorless, transparent, octahedral crystals, when obtained by the spontaneous evaporation of cold solutions; odorless; sweetish, astringent, afterward metallic, taste; permanent in the air. Made by treating lead oxide with diluted nitric acid, evaporating and crystallizing.

PLUMBI OXIDUM, U. S.—Lead Oxide. PbO; 221.23. (*Litharge.*)—Should contain not less than 96 per cent. of pure Lead Oxide. A heavy, yellowish or reddish-yellow powder or minute scales. Odorless; tasteless. On exposure to the air it slowly absorbs moisture and carbon dioxide. Average dose, 0.500 Gm. (7½ gr.). Made by roasting lead ore.

Red Lead is a higher oxide. Pb_3O_4. Made by sprinkling hot litharge with water, powdering, drying and heating out of contact with air.

COPPER. Cu; 63.1.

CUPRI SULPHAS, U. S.—Copper Sulphate. (*Cupric Sulphate.*) $CuSO_4 + 5H_2O$; 247.85.—Should contain not less than 99.5 per cent. of pure Copper Sulphate, $[SO_2 . O_2Cu + 5H_2O]$. Large, transparent, deep-blue, triclinic crystals; slowly efflorescent in dry air; odorless; nauseous, metallic taste. Average dose, Astringent, 0.010 Gm. ($\frac{1}{6}$ gr.); Emetic, 0.250 Gm. (4 gr.). Commonly called *blue vitriol*. Made by treating copper with diluted sulphuric acid, evaporating the solution, and crystallizing.

SILVER. Ag; 107.12.

A brilliant white metal, very malleable and ductile, having a specific gravity of 10.4 to 10.5.

ARGENTI CYANIDUM, U. S.—Silver Cyanide. $AgCN$; 132.96. —Should contain not less than 99.9 per cent. of pure Silver Cyanide, corresponding to 80.48 per cent. of metallic silver. A white powder, without odor or taste, permanent in dry air, but gradually turning brown by exposure to light. Made by passing hydrocyanic gas into solution of silver nitrate, or by mixing solutions of silver nitrate with potassium cyanide:—

$$\underset{\substack{\text{Silver}\\\text{Nitrate.}}}{AgNO_3} + \underset{\substack{\text{Potassium}\\\text{Cyanide.}}}{KCN} = \underset{\substack{\text{Silver}\\\text{Cyanide.}}}{AgCN} + \underset{\substack{\text{Potassium}\\\text{Nitrate.}}}{KNO_3}.$$

ARGENTI NITRAS, U. S.—Silver Nitrate. $AgNO_3$; 168.69.—Should contain not less than 99.9 per cent. of pure Silver Nitrate. Colorless, transparent, tabular, rhombic crystals, becoming gray or grayish-black on exposure to light in the presence of organic matter; odorless; bitter, caustic, and strongly metallic taste; neutral reaction. Made by treating metallic silver with nitric acid, evaporating and crystallizing:—

$$\underset{\text{Silver.}}{Ag_3} + \underset{\text{Nitric Acid.}}{4HNO_3} = \underset{\text{Silver Nitrate.}}{3AgNO_3} + \underset{\substack{\text{Nitrogen}\\\text{Monoxide.}}}{NO} + \underset{\text{Water.}}{2H_2O}.$$

ARGENTI NITRAS FUSUS, U. S.—Moulded Silver Nitrate. (*Lunar Caustic. Toughened Caustic.*)—Should contain not less than 94.8 per cent. of pure Silver Nitrate. Made by fusing and moulding silver nitrate in the form of points or cones. The description applied to mitigated caustic answers for the fused nitrate except the fracture of the latter is fibrous instead of granular. The official process calls for a small portion of HCl, which is added to give greater toughness to the pencils.

ARGENTI NITRAS MITIGATUS, U. S.—Mitigated Silver Nitrate. (*Mitigated Caustic. Diluted Silver Nitrate.*) [Argenti Nitras Dilutus, Pharm. 1890.]—Should contain not less than 33.3 per cent. of pure Silver Nitrate. A white, hard solid, generally in form of pencils or cones of a finely granular fracture, becoming gray, or grayish-black on exposure to light in presence of organic matter. Odorless, having a caustic, metallic taste and a neutral reaction. Made by melting together one part of nitrate of silver and two of nitrate of potassium, and moulding.

ARGENTI OXIDUM, U. S.—Silver Oxide. Ag_2O; 230.12.—Should contain 99.8 per cent. of pure Silver Oxide, corresponding to not less than 92.9 per cent. of pure metallic silver. Should not be triturated with readily oxidizable or combustible substances, and should not be brought in contact with ammonia. A heavy, dark brownish black powder, liable to reduction by exposure to light; odorless; metallic taste. Average dose, 0.065 Gm. (1 gr.). Made by precipitating solution of silver nitrate with solution of potassium hydroxide:—

$$\underset{\text{Silver Nitrate.}}{2AgNO_3} + \underset{\text{Potassium Hydroxide.}}{2KHO} = \underset{\text{Silver Oxide.}}{Ag_2O} + \underset{\text{Potassium Nitrate.}}{2KNO_3} + \underset{\text{Water.}}{H_2O.}$$

MERCURY. Hg; 198.5.

HYDRARGYRUM, U. S.—Mercury. Hg; 198.5. (*Quicksilver.*) —A shining, silver-white metal; odorless and tasteless; liquid at ordinary temperatures, containing not less than 99.9 per cent. of pure metallic mercury.

Mercury may be purified from mechanical impurities by squeezing it through chamois, or by distillation with HCl, after which the HCl is washed out with distilled water, and the mercury dried by the aid of filtering paper and a water-bath.

HYDRARGYRUM AMMONIATUM, U. S.—Ammoniated Mercury. $HgNH_2Cl = 249.61$. (*White Precipitate. Mercuric Ammonium Chloride.*)—It should contain not less than 78 per cent. and not more than 80 per cent. of metallic mercury. White, pulverulent pieces, or a white, amorphous powder, permanent in the air; odorless, and having an earthy, afterward styptic and metallic taste. Made by precipitating solution of mercuric chloride with water of ammonia:—

$$\underset{\text{Mercuric Chloride.}}{HgCl_2} + \underset{\text{Water of Ammonia.}}{2NH_4HO} = \underset{\text{Ammonium Chloride.}}{NH_4Cl} + \underset{\text{Mercurammonium Chloride.}}{NH_2HgCl} + \underset{\text{Water.}}{2H_2O.}$$

HYDRARGYRI CHLORIDUM CORROSIVUM, U. S.—Corrosive Mercuric Chloride.—$HgCl_2$; 264.86. (*Corrosive Sublimate. Mercuric Chloride.*)—Should contain not less than 99.5 per cent. of pure Mercuric Chloride. Heavy, colorless, rhombic crystals, or crystalline masses, permanent in the air; odorless; acrid and persistent metallic taste. Average dose, 0.003 Gm. ($\frac{1}{20}$ gr.). Made by subliming mercuric sulphate with sodium chloride.

The mercuric sulphate is formed by boiling Hg with H_2SO_4:—

$$\underset{\text{Sulphuric Acid.}}{2H_2SO_4} + \underset{\text{Mercury.}}{Hg} = \underset{\text{Mercuric Sulphate.}}{HgSO_4} + \underset{\text{Sulphurous Acid.}}{SO_2} + \underset{\text{Water.}}{2H_2O.}$$

This is mixed with NaCl and sublimed. The following reaction occurs. Sodium sulphate remains behind:—

$$\underset{\text{Mercuric Sulphate.}}{HgSO_4} + \underset{\text{Sodium Chloride.}}{(NaCl)_2} = \underset{\text{Sodium Sulphate.}}{Na_2SO_4} +$$

HYDRARGYRI CHLORIDUM MITE, U. S.—
Chloride. HgCl; 233.68. (*Calomel. Mercurous chloride of Mercury. Subchloride of Mercury.*)—Sho
than 99.5 per cent. of pure Mercurous Chloride. A
powder, becoming yellowish-white on being triturate

sure and showing only small, isolated crystals when viewed under a lens having a magnifying power of one hundred diameters; permanent in the air; odorless and tasteless. Average dose, Laxative, 0.125 Gm. (2 gr.); Alterative, 0.065 Gm. (1 gr.). Prepared by subliming mercuric sulphate and mercury with sodium chloride.

In preparing calomel, mercuric sulphate is formed in the same manner as in the preparation of corrosive sublimate; this is then triturated with a quantity of mercury equal to that used in forming it, thus producing mercurous sulphate, which is then sublimed with sodium chloride. Sodium sulphate remains behind:—

$$\underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} + \underset{\text{Mercury.}}{Hg} = \underset{\substack{\text{Mercuric}\\\text{Sulphate.}}}{HgSO_4} + \underset{\substack{\text{Sulphur}\\\text{Dioxide.}}}{SO_2} + \underset{\text{Water.}}{2H_2O.}$$

$$\underset{\substack{\text{Mercuric}\\\text{Sulphate.}}}{HgSO_4} + \underset{\text{Mercury.}}{Hg} = \underset{\substack{\text{Mercurous}\\\text{Sulphate.}}}{Hg_2SO_4.}$$

$$\underset{\substack{\text{Mercurous}\\\text{Sulphate.}}}{Hg_2SO_4} + \underset{\substack{\text{Sodium}\\\text{Chloride.}}}{2NaCl} = \underset{\substack{\text{Mercurous}\\\text{Chloride.}}}{Hg_2Cl_2} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4.}$$

HYDRARGYRI IODIDUM FLAVUM, U. S.—Yellow Mercurous Iodide. HgI; 324.40. [Hydrargyri Iodidum Viride, Pharm. 1880.] (*Protiodide of Mercury. Yellow* (*or Green*) *Iodide of Mercury.*) —It should contain not less than 99.5 per cent. of pure Mercurous Iodide. Bright, yellow amorphous powder. Odorless and tasteless. By exposure to the light it becomes darker, in proportion as it undergoes decomposition into metallic mercury and mercuric iodide. Average dose, 0.010 Gm. ($\frac{1}{5}$ gr.). To make, first prepare crystals of mercurous nitrate. Dissolve the crystals in solution HNO_3. Now make solution KI and pour it into the solution Mercurous Nitrate. Wash the precipitate by 10 decantations. Dry in dark.

HYDRARGYRI IODIDUM RUBRUM, U. S.—Red Mercuric Iodide. HgI_2; 450.30. (*Biniodide of Mercury. Red Iodide of Mercury.*)—A scarlet-red, amorphous powder, permanent in the air; odorless and tasteless. Average dose, 0.003 Gm. ($\frac{1}{20}$ gr.). Made by double decomposition between mercuric chloride and potassium iodide:—

$$\underset{\substack{\text{Mercuric}\\\text{Chloride.}}}{HgCl_2} + \underset{\substack{\text{Potassium}\\\text{Iodide.}}}{2KI} = \underset{\substack{\text{Mercuric}\\\text{Iodide.}}}{HgI_2} + \underset{\substack{\text{Potassium}\\\text{Chloride.}}}{2KCl.}$$

HYDRARGYRI OXIDUM FLAVUM, U. S.—Yellow Mercuric Oxide. HgO; 214.38.—A light orange-yellow, heavy, impalpable powder, permanent in the air and turning darker on exposure to light and containing not less than 99.5 per cent. of pure Yellow Mercuric Oxide, made by double decomposition between Mercuric Chloride and Sodium Hydroxide.

$$\underset{\substack{\text{Mercuric}\\\text{Chloride.}}}{HgCl_2} + \underset{\substack{\text{Sodium}\\\text{Hydroxide.}}}{2NaHO} = \underset{\substack{\text{Mercuric}\\\text{Oxide.}}}{HgO} + \underset{\substack{\text{Sodium}\\\text{Choride.}}}{2KCl} + \underset{\text{Water.}}{H_2O.}$$

HYDRARGYRI OXIDUM RUBRUM, U. S.—Red Mercuric Oxide. HgO; 214.38. (*Red Precipitate.*)—Should contain not less than 99.5 per cent. of pure Red Mercuric Oxide. Heavy, orange-red, crystalline scales, or a crystalline powder, becoming more yellow the finer it is divided, permanent in the air; odorless, with somewhat metallic taste. Made by decomposing mercuric nitrate by heat:—

$$\begin{array}{ccccccc} 2Hg(NO_3)_2 & = & 2HgO & + & 4NO_2 & + & O_2. \\ \text{Mercuric Nitrate.} & & \text{Mercuric Oxide} & & \text{Nitrogen Dioxide.} & & \text{Oxygen.} \end{array}$$

ANTIMONY, ARSENIC AND BISMUTH.

ANTIMONY (STIBIUM). Sb; 119.3.

ANTIMONII ET POTASSII TARTRAS, U. S.—Antimony and Potassium Tartrate. $2K(SbO)C_4H_4O_6 + H_2O = 659.80$. (*Tartar Emetic. Tartarated Antimony.*)—It should contain not less than 99.5 per cent. of pure Antimony and Potassium Tartrate, $[2C_2H_2(OH)_2\text{-}(COOK)COOSbO + 2H_2O]$. Colorless, transparent crystals of the rhombic system, becoming opaque and white on exposure to air, or a white, granular powder; without odor; sweet, afterward disagreeable metallic taste; feebly acid reaction. Average dose, Expectorant, 0.005 Gm. ($\frac{1}{10}$ gr.); Emetic, 0.030 Gm. ($\frac{1}{2}$ gr.). Made by boiling antimonous oxide and acid potassium tartrate together with water, evaporating and crystallizing:—

$$\begin{array}{ccccccc} 2KHC_4H_4O_6 & + & Sb_2O_3 & = & 2KSbOC_4H_4O_6 & + & H_2O. \\ \text{Acid Potassium Tartrate.} & & \text{Antimonous Oxide.} & & \text{Antimony Potassium Tartrate.} & & \text{Water.} \end{array}$$

ARSENIC. As; 74.4.

ARSENI TRIOXIDUM, U. S.—Arsenic Trioxide. As_2O_3; 196.44. [Acidum Arsenosum, Pharm. 1890.] (*Arsenous Acid. Arsenous Anhydride. Arsenous Oxide. White Arsenic.*)—Should contain not less than 99.8 per cent. of pure Arsenic Trioxide. A heavy solid, occurring either as an opaque white powder, or in irregular masses of two varieties: one, amorphous, transparent and colorless, like glass; the other, crystalline, opaque, and white, resembling porcelain. Frequently the same piece has an opaque, white outer crust enclosing the glassy variety. Contact with moist air gradually changes the glassy into the white, opaque variety. Both are odorless and tasteless. Average dose, 0.002 Gm. ($\frac{1}{30}$ gr.). Prepared by roasting arsenical ores, and resubliming the sublimate.

The oxide (As_2O_3) becomes an acid (H_3AsO_3) when add

ARSENI IODIDUM, U. S.—Arsenous Iodid
(*Arsenic Iodide.*)—Should contain not less than 8
and 16.3 per cent. of Metallic Arsenic. An
crystalline powder, stable when protected fr
kept in a cool place. Average dose, 0.005
fusing 1 per cent. of arsenic and 5 per cent. of i

BISMUTH. Bi; 206.9.

BISMUTHI CITRAS, U. S.—Bismuth Citrate. $BiC_6H_5O_7$; 394.52.—Should yield not less than 58 per cent., nor more than 60 per cent., of pure bismuth oxide. A white, amorphous powder, permanent in the air; odorless and tasteless. Average dose, 0.125 Gm. (2 gr.). Prepared by boiling bismuth subnitrate with citric acid and water, and adding distilled water to the clear solution. The reaction is as follows:—

$$\underset{\text{Bismuth Subnitrate.}}{BiONO_3.H_2O} + \underset{\text{Citric Acid.}}{H_3C_6H_5O_7} = \underset{\text{Bismuth Citrate.}}{BiC_6H_5O_7} + \underset{\text{Nitric Acid.}}{HNO_3} + \underset{\text{Water.}}{2H_2O}.$$

BISMUTH ET AMMONII CITRAS, U. S.—Bismuth and Ammonium Citrate.—Should yield not less than 48 per cent. pure bismuth oxide. Shining, pearly or translucent scales; odorless, having a metallic taste, and becoming opaque with loss of ammonia on exposure to air. Made by dissolving bismuth citrate in water of ammonia, evaporating the solution, and scaling. Average dose, 0.125 Gm. (2 gr.).

BISMUTHI SUBCARBONAS, U. S.—Bismuth Subcarbonate.—Should yield not less than 90 per cent. of pure Bismuth Oxide. A white, or pale yellowish-white powder, permanent in the air; odorless and tasteless. Made by dissolving bismuth in nitric acid, purifying, and precipitating by adding solution of sodium carbonate. Average dose, 0.500 Gm. (7½ gr.).

BISMUTHI SUBGALLAS.—Bismuth Subgallate. (*Dermatol.*)—Should yield not less than 52 per cent., nor more than 57 per cent., of pure bismuth oxide. An amorphous, bright yellow powder, somewhat variable in chemical composition, without odor or taste, and permanent in the air. Made by dissolving the subnitrate in diluted acetic acid and precipitating with gallic acid, or by Thibault's process, which consists of triturating the trioxide with water, adding excess of gallic acid, triturating until greenish-yellow, and, after standing 24 hours, washing with water, and drying. Average dose, 0.250 Gm. (4 gr.).

BISMUTHI SUBNITRAS, U. S.—Bismuth Subnitrate.—Should yield not less than 80 per cent. of pure bismuth oxide. A white powder, of somewhat varying chemical composition, colorless and almost tasteless, and permanent in the air. Average dose, 0.500 Gm. (7½ gr.). Prepared by dissolving bismuth in nitric acid, purifying and adding the solution, in nitric acid, to water. The reactions are as follows:—

$$\underset{\text{Bismuth.}}{Bi_2} + \underset{\text{Nitric Acid.}}{8HNO_3} = \underset{\text{Bismuth Nitrate.}}{2Bi(NO_3)_3} + \underset{\text{Water.}}{4H_2O} + \underset{\text{Nitrogen Monoxide.}}{2NO}.$$

then—

$$\underset{\text{Bismuth Nitrate.}}{5Bi(NO_3)_3} + \underset{\text{Water.}}{8H_2O} = \underset{\text{Bismuth Subnitrate.}}{4BiONO_3.H_2O} + \underset{\text{Bismuth Nitrate.}}{Bi(NO_3)_3} + \underset{\text{Nitric}}{8HNO_3}.$$

BISMUTH SUBSALICYLAS, U. S.—Bismuth Su

Should yield not less than 62 nor more than 64 per ce muth oxide. A white, or nearly white, amorphous or crystalline powder, odorless, tasteless, and permanent in the air. Average dose, 0.250 Gm. (4 gr.). Made by Thibault's process: A solution of bismuth nitrate in HNO_3 is ppt. with sod. hydrox. and boiled, thus transformed into yellow cryst. anhyd. oxide. To this is then added a solution of salicylic acid, and, when all the crystals of the oxide disappear, it is washed with cold alcohol, and dried.

GOLD AND PLATINUM.

Au; 195.7. Pt; 193.3.

AURI ET SODII CHLORIDUM, U. S.—Gold and Sodium Chloride.—A mixture of equal parts, by weight, of anhydrous Gold Chloride, [$AuCl_3$ = 301.24], and anhydrous Sodium Chloride, [$NaCl$ = 58.06], representing not less than 30 per cent. of metallic gold. An orange-yellow powder, odorless, deliquescent in damp air; saline, metallic taste. Average dose, 0.005 Gm. ($\frac{1}{10}$ gr.). Made by dissolving gold in nitrohydrochloric acid, evaporating to dryness, weighing, and dissolving in eight times its weight of distilled water. Pure decrepitated common salt, equal in weight to the dry chloride, is then added, previously dissolved in four parts of water. The mixture is then evaporated to dryness, with constant stirring.

TEST-SOLUTION OF PLATINIC CHLORIDE.—2.6 Gm. of chloroplatinic acid, $H_2PtCl_6 + 6H_2O$, in 20 Cc. of water.

PART IV.

PREPARATIONS OF THE ORGANIC MATERIA MEDICA.

Organic Chemistry: *The science of the carbon compounds.*

The following pages treat of both official and non-official organic substances, and the former may be distinguished from the latter by the letters U. S. following the official names.

THE CELLULOSE GROUP.

CELLULOSE. $C_6H_{10}O_5$.

Cellulose: The woody fibre of plants, forming the skeleton for the vegetable tissues. It is seen in the pure condition in raw cotton, the hairs of the seed of the cotton plant, and in many vegetable products. It is white, translucent, unalterable in the air; sp. gr. 1.5; insoluble in all the usual solvents, but soluble in ammoniacal solution of oxide of copper; converted into dextrin by treating with strong sulphuric or phosphoric acid, and, further, converted into glucose if the mixture be diluted with water and heated.

Lignin: The substances which are found adhering to the cellulin skeleton of plants and vegetable tissues.

Parchment paper: Cellulose, in the form of unsized paper, after treatment with a mixture consisting of 2 per cent. H_2SO_4, sp. gr. 1.840, and 1 per cent. H_2O, by measure, cooled to 15° C. (59° F.) and washing in dilute NH_4HO.

For what parchment paper is used in pharmacy: As a septum for dialysis.

Important principle in pharmacy owing to the insolubility of cellulose in ordinary solvents: As cellulose forms the bulk of inert matter in plants, and is insoluble in ordinary solvents, active principles soluble in such solvents can be readily separated from it. Such a solvent is known as a menstruum (pl. menstrua).

GOSSYPIUM PURIFICATUM, U. S.—Purified Cotton. [Gossypium, Pharm. 1880.] (*Absorbent Cotton.*)—The hairs of the seeds of *Gossypium Herbaceum* or of other cultivated species of *Go*
(Fam. *Malvaceæ*), freed from adhering impurities, and de
fatty matter by boiling it in a weak alkaline solution,

in a weak solution of chlorinated lime, to whiten it, dipping it in a very dilute solution of HCl, washing with cold water, drying, and carding. The loss is about 10 per cent.

PRODUCTS RESULTING FROM THE DECOMPOSITION OF CELLULOSE.

PYROXYLINUM, U. S.—Pyroxylin. (*Soluble Gun-Cotton.*)—A very inflammable, slightly explosive substance, resembling cotton, formed by acting on cotton 1 Gm. with nitric acid 14 Cc. and sulphuric acid 22 Cc. until a portion taken out is found soluble in a mixture consisting of 1 per cent. Alcohol, 3 per cent. Ether (by volume), after which it is washed and dried.

It belongs to a series of closely related nitro-compounds, in which the nitric acid radical replaces the hydroxyl of the cellulose formula. This may be shown by taking the double formula, for cellulose, $C_{12}H_{20}O_{10}$, and the displacement of the HO, thus:—

$$\underset{\text{Nitric Acid.}}{6HNO_3} + \underset{\text{Cellulose.}}{C_{12}H_{20}O_{10}} = \underset{\text{Cellulose-hexanitrate.}}{C_{12}H_{14}O_4(NO_3)_6} + \underset{\text{Water.}}{6H_2O.}$$

$$\underset{\text{Nitric Acid.}}{5HNO_3} + \underset{\text{Cellulose.}}{C_{12}H_{20}O_{10}} = \underset{\text{Cellulose-pentanitrate.}}{C_{12}H_{15}O_5(NO_3)_5} + \underset{\text{Water.}}{5H_2O.}$$

$$\underset{\text{Nitric Acid.}}{4HNO_3} + \underset{\text{Cellulose.}}{C_{12}H_{20}O_{10}} = \underset{\text{Cellulose-tetranitrate.}}{C_{12}H_{16}O_6(NO_3)_4} + \underset{\text{Water.}}{4H_2O.}$$

$$\underset{\text{Nitric Acid.}}{3HNO_3} + \underset{\text{Cellulose.}}{C_{12}H_{20}O_{10}} = \underset{\text{Cellulose-trinitrate.}}{C_{12}H_{17}O_7(NO_3)_3} + \underset{\text{Water.}}{3H_2O.}$$

$$\underset{\text{Nitric Acid.}}{2HNO_3} + \underset{\text{Cellulose.}}{C_{12}H_{20}O_{10}} = \underset{\text{Cellulose-dinitrate.}}{C_{12}H_{18}O_8(NO_3)_2} + \underset{\text{Water.}}{2H_2O.}$$

The soluble pyroxylin used in preparing collodion is a varying mixture of the di-, tri-, tetra-, and pentanitrates, but mainly tetranitrate. The hexanitrate is a true explosive gun-cotton, and is insoluble in ether, alcohol and water.

Celluloid.—A substance made from pyroxylin, camphor and coloring matter heated together and powerfully pressed into appropriate moulds.

Pyroxylin was once extensively employed by photographers for producing the basis of the sensitized film upon which impressions are made. It is now replaced to a great extent by gelatin.

Pharmaceutically pyroxylin is used in collodion. (See Collodia, Part II.)

ACIDUM OXALICUM.—Oxalic Acid. $H_2C_2O_4 + 2H_2O$; 125.10.—Small, colorless, prismatic crystals; odorless, and with a very sour taste. Made by acting on cellulin, sugar, or starch, with nitric acid; but prepared on a commercial scale by heating sawdust with a mixture of two molecules caustic soda and one molecule caustic potash. The gray mass [illegible] whereby the potash is removed as car- [illegible] oxalate remains. This is converted [illegible] and then decomposed with H_2SO_4,

PRODUCTS RESULTING FROM THE DESTRUCTIVE DISTILLATION OF CELLULOSE AND LIGNIN.

When wood is distilled in close vessels without air several solid, liquid, and gaseous products are formed, of which the principal ones are the following:—

SOLID.—Charcoal, inorganic salts, etc. LIQUIDS.—1. Aqueous liquid, containing *acetic, formic, butyric, crotonic, capronic, propionic acids, acetone, methylic alcohol, furfurol, methylamine, pyrocatechin*, and small quantities of empyreumatic oils and resins. 2. Tarry liquid, containing *toluol, xylol, cumol, methol, mesitylene, pseudocumol, phenol, cresol, guaiacol, creasol; phlorol*, and *methylcreasol, naphthalene, paraffin, pyrene, chrysene, retene, mesit.* GASES.—*Carbon dioxide, carbon monoxide, marsh gas, acetylene, ethylene, propene*, and others.

The most important of these: Charcoal, tar, acetic acid, acetone, methylic alcohol, and creosote.

ACIDUM ACETICUM, U. S.—Acetic Acid. $CH_3COOH = 59.58$.—A clear, colorless liquid, having a strong vinegar-like odor, purely acid taste, strongly acid reaction, composed of not less than 36 per cent. absolute acetic acid and about 64 per cent. water. Obtained by the oxidation of ethyl alcohol or by the destructive distillation of wood.

Acetic acid is also made by distilling *vinegar*, which, in turn, is made by oxidizing dilute alcoholic liquids. In Germany it is made by oxidizing alcohol, by pouring a very dilute alcoholic solution on beechwood shavings, which exposes a large surface to the air.

Two strengths of acetic acid found in commerce: The official acid and No. 8 acid. The former has a sp. gr. of about 1.045; the latter 1.037, and is 20 per cent. weaker. It is called No. 8 acid because it was formerly used in the proportion of 1 to 8 to make dilute acetic acid or distilled vinegar.

ACIDUM ACETICUM DILUTUM, U. S.—Diluted Acetic Acid.—The liquid used as the menstruum for the official vinegars, containing not less than 6 per cent. absolute [CH_3COOH]; sp. gr. 1.008. Made by diluting 100 Gm. acetic acid with 500 Gm. distilled water, to make 600 Gm. Sp. gr. about 1.009 at 25° C. (77° F.). Average dose 2 Cc. (30 ♏).

ACIDUM ACETICUM GLACIALE, U. S.—Glacial Acetic Acid. $CH_3COOH = 59.58$.—A clear, colorless liquid, of a strong, vinegar-like odor, and a very pungent, purely acid taste. Somewhat below 15° C. (59° F.), a crystalline solid. Made by heating sodium acetate until the water of crystallization has been driven off, powdering the residue, and distilling it with concentrated sulphuric acid. The reaction is as follows:—

$$\underset{\substack{\text{Sodium}\\\text{Acetate.}}}{NaC_2H_3O_2} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{H_2SO_4} = \underset{\substack{\text{Glacial}\\\text{Acetic Acid.}}}{HC_2H_3O_2} + \underset{\substack{\text{Acid Sodium}\\\text{Sulphate.}}}{NaHSO_4}.$$

ACIDUM TRICHLORACETICUM.—Trichloracetic $HC_2H_3O_2 = 162.12$. A monobasic organic acid, [$CCl_3.CO$

ally obtained by the oxidation of hydrated chloral with fuming nitric acid. White, deliquescent, rhombohedral crystals, having a slight characteristic odor.

ACETONUM, U. S.—Acetone.—A liquid containing not less than 99 per cent. by weight of absolute acetone, [Dimethyl-ketone, CH_3-$CO.CH_3 = 57.61$]. It should be kept in well-closed vessels, in a cool place, remote from lights or fire. A transparent, colorless, mobile and volatile liquid of a characteristic etheric odor and a pungent, sweetish taste. Sp. gr.: 0.790 at 25° C. (77° F.). Miscible with water in all proportions, without cloudiness; also miscible with alcohol, ether, chloroform, and volatile oils. May be made by distilling dry calcium acetate at 290° C. (554° F.).

PIX LIQUIDA, U. S.—Tar.—A product obtained by the destructive distillation of the wood of *Pinus palustris* and of other species of *pinus* (Fam. *Pinaceæ*). It is usually obtained as a by-product in the manufacture of charcoal or acetic acid. Semiliquid, viscid, blackish-brown, non-crystalline, translucent in thin layers, becoming granular and opaque with age; odor empyreumatic, terebinthinate; taste sharp and empyreumatic. Average dose, 0.500 Gm. (7½ gr.).

Official Preparations.—Syrupus Picis Liquidæ, Unguentum Picis Liquidæ.

OLEUM PICIS LIQUIDAE, U. S.—Oil of Tar.—An almost colorless liquid, distilled from tar, soon acquiring a dark, reddish-brown color when exposed to the air; having a strong, tarry odor and taste; sp. gr. about 0.965.

Black Pitch.—The residue left after the distillation of tar.

OLEUM CADINUM, U. S.—Oil of Cade. (*Oil of Juniper Tar. Oleum Juniperi Empyreumaticum.*)—A product of the dry distillation of the wood of *Juniperus Oxycedrus.* A brownish or dark brown, clear, thick liquid, having a tarry odor and a somewhat burning taste.

CREOSOTUM, U. S.—Creosote.—A mixture of phenols and phenol derivatives, chiefly guaiacol and cresol, obtained during the distillation of wood-tar, preferably of that derived from the bush, *Fagus silvatica* or *Fagus ferruginea* (Fam. *Fagaceæ*). An almost colorless, yellowish (not pinkish), highly refractive, oily liquid; penetrating, smoky odor; burning, caustic taste. It should not become brown in color on exposure to light. Sp. gr. not below 1.072 at 25° C. (77° F.).

Creosote consists mainly of the following phenols: *guaiacol* or *oxycresol*, $C_7H_8O_2$, boiling at 200° C. (392° F.); *creosol*, $C_8H_{10}O_2$, boiling at 217° C. (422.6° F.); *methylcreosol*, $C_9H_{12}O_2$, boiling at 214° C. (417° F.) to 218° C. (424.4° F.); *phlorol*, $C_8H_{10}O$, boiling at 219° C. (426.2° F.).

When wood tar is distilled, a solution of several layers is formed. The lower, oily layer is treated with K_2CO_3, to neutralize the acid present. Fractional distillation, with alternate treatment of the distillate with H_2SO_4 and KHO, to separate impurities, and final distillation, yields the product called creosote, which comes over between 205° and 220° [illegible] 428° F.).

he liquid sold for creosote in the market is impure carbolic acid or coal tar creosote. It is distinguished from true wood creosote by the tests for identity given in the U. S. Pharm., 8th rev.

Official Preparation.—Aqua Creosoti.

GUAIACOL, U. S.—Guaiacol. $C_7H_8O_2 = 123.13$.—One of the chief constituents $[C_2H_4(OH)(OCH_3)1 : 2]$ of creosote, the product from beechwood tar, obtained by collecting and purifying the fraction of creosote, boiling between 200° and 205° C. (392° and 401° F.); or prepared synthetically from either catechol by methylating, or from ortho-anisidin by diazotizing and boiling. A colorless, crystalline solid, melting at 28.5° C. (83.3° F.), or a colorless refractive liquid, boiling at 205° C. (401° F.), having an agreeable, aromatic odor. Average dose, 0.5 Cc. (8 ♏).

GUAIACOLIS CARBONAS, U. S.—Guaiacol Carbonate. (*Duotal.*) $(C_7H_7O)_2CO_3 = 272.05$.—A guaiacol derivative, $[(C_6H_4(OCH_3)O)_2 . CO]$, obtained by the action of carbonyl chloride upon sodium-guaiacolate. White, crystalline powder of neutral reaction, almost tasteless and odorless. Average dose, 1 Gm. (15 gr.).

PRODUCTS RESULTING FROM THE NATURAL DECOMPOSITION OF CELLULIN AND LIGNIN AND THEIR DERIVATIVES.

Coal.—A fossil formation found in the earth, formed by the decomposition of cellulin, lignin, etc., under the changing influence of moisture, temperature, and pressure.

Coal Tar.—A residue left after the dry distillation of bituminous coal in the process of making illuminating gas. It consists of a large number of products in the forms of solids, liquids, and gases, a number of which form very valuable products in the arts.

NAPHTHALENUM, U. S.—Naphthalene. $C_{10}H_8$; 127.10. [Naphthalinum, Pharm. 1890.] (*Naphtalin. Naphthalin.*) A hydrocarbon obtained from coal-tar and purified by crystallization. Colorless, shining, transparent laminæ, slowly volatilized on exposure to air; by exposure to light acquiring a brownish color; strong, characteristic odor resembling that of coal-tar; burning, aromatic taste. May be obtained by subjecting coal-tar to distillation, when it passes over after the coal naphtha. Frequently produced by dry distillation of organic bodies. Also known as *coal-tar camphor*, and employed to prevent the ravages of moths in woolen clothing.

BETANAPHTHOL, U. S.—Betanaphthol. $C_{10}H_7OH = 142.98$.—[Naphtol, Pharm. 1890.] A monatomic phenol occurring in coal-tar, but usually prepared from naphtalin. Colorless, or pale buff-colored, shining, crystalline laminæ, or a white, or yellowish-white, crystalline powder, having a faint phenol-like odor and a sharp and pungent, but not persistent taste. Permanent in the air. When naphthalene is digested with fuming H_2SO_4, two acids may be obtained; at a temperature of 80° to 90° C. (176° to 194° F.) alphnapthalene sulphonic acid is chiefly formed, but at 200° C. (392° F.) the beta variety is the principal product. When the beta acid is fused with an alkali hydroxide and HCl added, the betanapthol is liberated.

CRESOL, U S.—Cresol. $C_7H_7 . OH = 107.25$.—A mixture, $[C_6H_4(CH_3).OH]$, of the three isomeric Cresols obtained from coal-tar, freed from phenol, hydrocarbons and water. Cresol, or cresylic acid, is an important constituent of coal-tar. It consists of a mixture of three isomers existing in the coal-tar approximately in the proportion of 40 per cent. of *metacresol*, 35 per cent. of *orthocresol*, and 25 per cent. of *paracresol*. As cresol has a higher boiling-point than phenol, it is separated from it by fractional distillation.

LIQUOR CRESOLIS COMPOSITUS, U. S.—Compound Solution of Cresol.—An antiseptic preparation closely resembling *lysol*, *creolin*, *solveol*, and *solutol*. Made by dissolving 50 Gm. of Potassium hydroxide in water, adding 350 Gm. of linseed oil, mixing thoroughly, adding 500 Gm. of Cresol (which must correspond with the U. S. P. tests), and stirring until a clear solution is produced. Finally, sufficient water is added to make the finished product weigh 1000 Gm.

PHENOL, U. S.—Phenol. $C_6H_5OH = 93.34$. [Acidum Carbolicum, Pharm. 1880.] (*Carbolic Acid.*)—Hydroxybenzene, obtained either from coal-tar by fractional distillation and subsequent purification, or made synthetically. It should contain, when assayed by the U. S. P. process, not less than 96 per cent. of absolute Phenol. Made by distilling crude carbolic acid, and separating and purifying the distillate by repeated crystallization. Colorless, interlaced, or separate needle-shaped crystals, or a white, crystalline mass, sometimes acquiring a reddish tint. Characteristic, somewhat aromatic odor; when copiously diluted with water it has a sweetish taste, with a slightly burning after-taste, and when undiluted, cauterizes and whitens the skin and mucous membranes; faintly acid reaction. Average dose, 0.065 Gm. (1 gr.).

Official Preparations.—Phenol Liquefactum; Unguentum Phenolis.

PHENOL LIQUEFACTUM, U. S.—Liquefied Phenol.—A liquid composed of not less than 86.4 per cent., by weight, of absolute Phenol, and about 13.6 per cent., by weight, of water. Prepared by melting the Phenol by placing the unstoppered container in a water-bath at gentle heat, transferring to a tared vessel, and adding to each 9 Gm., 1 Gm. of distilled water. Dose, 0.05 Cc. (1 ♏).

Official Preparation.—Glyceritum Phenolis.

THYMOL, U. S.—Thymol. $C_{10}H_{14}O = 148.98$.—A phenol, $[C_6H_3(CH_3)(OH)(C_3H_7)\ 1:3:4]$, occurring in the volatile oil of *Thymus vulgaris*, and in some other volatile oils. Large, colorless, translucent, rhombic prisms; aromatic, thyme-like odor; pungent, aromatic taste, with a very slight caustic effect on the lips. Obtained from the volatile oils of several plants by which terpenes are separated. Has been obtained synthetically. Average dose, 0.125 Gm. (2 gr.).

THYMOLIS IODIDUM, U. S.—Thymol Iodide. $C_{20}H_{24}O_2I_2 = 545.76$. (*Aristol.*)—Dithymol Diiodide, $[C_6H_2 . CH_3 . C_3O_7 . OI)_2]$, obtained by the condensation of two molecules of thymol and the introduction of two atoms of iodine into the phenolic groups of the thymol it contains 45 per cent. of iodine. A bright, chocolate-colored, or reddish-yellow, bulky powder; very slight, aromatic odor. May be made by adding thymol dissolved in sodium hydroxide solution to an aqueous solution of iodine and KI. The precipitate is washed and dried.

RESORCINOL, U. S.—Resorcinol. [Resorcinum, Pharm. 1890. *Resorcin.*] $C_6H_6O_2$; 109.22. (*Resorcinol.*)—A diatomic phenol [metadihydroxybenzene, $C_6H_4(OH)_2$ 1 : 3)], obtained usually by the reaction of fused sodium hydroxide upon sodium metabenzenedisulphonate. Colorless, needle-shaped crystals. It acquires a pinkish tint on exposure to light and air. Faint, peculiar odor, followed by a bitter taste; neutral or only slightly acid reaction. It is a diatomic phenol isomeric with *pyrocatechin* and *hydroquinone.* Average dose, 0.125 Gm. (2 gr.).

ACIDUM SALICYLICUM, U. S.—Salicylic Acid. $HC_7H_5O_3$; 137.01.—A monobasic organic acid, [$C_6H_4(OH)COOH$ 1 : 2], existing naturally in combination in various plants, but generally prepared synthetically from phenol. Light, fine, white, prismatic needles, or a bulky, white, crystalline powder, permanent in the air, odorless, or having a slight gaultheria-like odor; sweetish, afterward acrid taste; acid reaction. Prepared by treating sodium phenol (or carbolate) with carbon dioxide. The sodium phenol is prepared by evaporating to dryness equal amounts of concentrated caustic soda solution and phenol; this is then heated to 100° C. (212° F.), while a stream of dry CO_2 is passed over it. The temperature is gradually raised as soon as the phenol distills over, until it reaches 250° C. (482° F.), until no more phenol distills. Half of the phenol used remains in the retort as sodium salicylate, while the other half distills over unchanged. The reaction is as follows:—

$$\underset{\text{Sodium Phenol.}}{2NaC_6H_5O} + \underset{\substack{\text{Carbon}\\ \text{Dioxide.}}}{CO_2} = \underset{\text{Phenol.}}{C_6H_6O} + \underset{\substack{\text{Normal Sodium}\\ \text{Salicylate.}}}{NaC_7H_4O_3}$$

The sodium salt thus obtained is then dissolved in water, decomposed by HCl, and the salicylic acid is filtered out, washed and crystallized, or purified by sublimation and superheated steam or by dialysis. Average dose, 0.500 Gm. = 500 Mg. (7½ gr.).

PHENYLIS SALICYLAS, U. S.—Phenyl Salicylate. $C_{13}H_{10}O_3$ = 212.47. [Salol, Pharm. 1890.]—The salicylic ester [$C_6H_4(OH)COOC_6H_5$ 1 : 2] of phenyl. A white, crystalline powder, faint, aromatic odor, slight, characteristic taste. Prepared by heating salicylic acid with phenol in the presence of certain acid chlorides (phosphoryl chloride or carbonyl chloride); the elements of water are withdrawn by this action, and the phenol group is caused to unite with the salicylic radical. Average dose, 0.500 Gm. (7½ gr.).

ACETPHENETIDINUM, U. S.—Acetphenetidin. $C_{13}H_{10}NO_2$ = 177.79. (*Phenacetin.*)—A phenol derivative [Acetparaphenetidin, $C_6H_4(OC_2H_5).NH\text{-}CH_3CO$ 1 : 4], the product of the acetylization of para-amidophenetol. White, glistening, crystalline scales or fine crystalline powder. Odorless and tasteless. Made by treating paraphenetidin,

$C_6H_4(NH_2)OC_2H_5$, with glacial acetic acid, which introduces the acetyl group, and acetparaphenetidin, $C_6H_4(NHC_2H_3O)OC_2H_5$, is formed.

METHYLTHIONINÆ HYDROCHLORIDUM, U. S.—Methylthionine Hydrochloride. Methylene-Blue. $C_{16}H_{18}N_3SCl = 317.36$. —Tetramethylthionine Hydrochloride, obtained by the action of hydrogen sulphide upon an oxidation product of para-amido-dimethylamine. A dark green, crystalline powder, or in the form of prismatic crystals having a bronze-like lustre. Made by treating an acid solution of dimethylparaphenylene diamine with hydrogen sulphide and ferric chloride. Average dose, 0.25 Gm. (4 gr.).

ACETANILIDUM, U. S.—Acetanilide (Antifebrin). C_8H_9NO; 134.09. (*Phenylacetamide.*)—The monacetyl derivative $[C_6H_5NH(CH_3.-CO)]$ of aniline. Colorless, shining, micaceous, crystalline laminæ, or a crystalline powder, permanent in the air. Odorless, slightly burning taste, neutral reaction. Made by heating a mixture of aniline and glacial acetic acid to the boiling-point; the cooled, congealed residue is purified by sublimation or recrystallization.

ANTIPYRINA, U. S.—Antipyrine. $C_{11}H_{12}N_2O = 186.75$.—Phenyldimethylpyrazolon, $[C_3HN_2O(CH_3)_2.C_6H_5]$, obtained by the condensation of phenylhydrazine with aceto-acetic ether, and methylation of the product. A colorless, crystalline powder or tabular crystals; almost odorless; slightly bitter taste; neutral reaction. Made by acting on phenylhydrazine with aceto-acetic ether when phenylmethylpyrazolon is formed; this is methylated by treatment with methyl-iodide, resulting in the formation of phenyldimethylpyrazolon or antipyrine. Average dose, 0.3 Gm. (5 gr.).

AMYLACEOUS AND MUCILAGINOUS PRINCIPLES AND THEIR PRODUCTS.

AMYLUM, U. S.—Starch.—Corn Starch.—The starch grains obtained from the fruit of *Zea Mays* (Fam. *Gramineæ*), in fine powder, or irregular, angular white masses, consisting of somewhat spherical but usually polygonal grains, about 0.010 to 0.025 Mm. in diameter, with a lenticular, circular, or triangular central fissure. Inodorous and tasteless.

Starch is present in many drugs and is an important constituent of many vegetable foods. It is usually made from potatoes by separating the cellular substance from the starch, by grating and pressing the soft mass upon a sieve, the starch granules falling through. It may be, also, prepared from wheat or corn, by allowing the grain to ferment, which disintegrates it, and stopping the fermentation before the starch is affected. The quality of starch depends largely upon the quality and purity of the water used in washing it.

Chemical Composition of Starch.—It has the same chemical composition as cellulose, $C_6H_{10}O_5$, and is closely allied to it and its properties.

Office of Starch in the Vegetable Kingdom.—It is stored up in plants as a food, in anticipation of future usefulness in the formation of plant tissues.

Description of the Starch Granule.—In young plants the starch granule is always spherical, but it subsequently becomes ovoid, lenticular, polyhedral, or irregular in shape. Various plants exhibit characteristic starch granules peculiar to each, which may be identified by the microscope. The granule occurs in concentrically arranged layers of different densities, arranged around a central point, usually situated at one end of the granule, and called the *hilum*.

Official Preparation.—Glyceritum Amyli.

MALTUM, U. S.—Malt.—The grain of barley, *Hordeum distichon* (Fam. *Gramineæ*), partially germinated artificially, and then dried.

Official Preparation.—Extractum Malti.

CHONDRUS, U. S.—Chondrus. (*Irish Moss.*)—The dried plant of *Chondrus crispus* (Fam. *Gigartinaceæ*), an alga growing in the Atlantic Ocean, containing 70 per cent. *carrageenin*, a mucilaginous principle differing from gum by not precipitating with alcohol; from starch, by not becoming blue with iodine; and from pectin, by not precipitating with subacetate of lead.

GUMS AND MUCILAGINOUS SUBSTANCES.

Gum, now known by the name, *arabin*, is a vegetable substance, forming a thick, glutinous liquid with water; insoluble in alcohol, and converted into mucic and oxalic acid with nitric acid.

Three Proximate Principles found in Gum.—*Arabin*, or arabic acid, $C_{12}H_{22}O_{11}$ (soluble), found in acacia; *Bassorin*, $C_{12}H_{20}O_{10}$ (insoluble), found in tragacanth; *Cerasin* (insoluble), found in cherry gum.

Gums differ from starch or cellulin by being soluble in water or by swelling up in contact with it.

They differ from sugar by being incapable of vinous fermentation with yeast.

ACACIA, U. S.—Acacia. (*Gum Arabic.*)—A gummy exudation from *Acacia Senegal*, and other species of acacia (Fam. *Leguminosæ*), consisting, mainly, of calcium, potassium, or magnesium arabate; occurring in roundish tears of various sizes, or broken into angular fragments; whitish or yellowish-white; translucent; very brittle, with a glass-like, sometimes iridescent fracture; nearly inodorous; taste insipid, mucilaginous; insoluble in alcohol; slowly and completely soluble in water, forming an odorless, mucilaginous liquid, which shows an acid reaction with blue litmus paper; yields a gelatinous precipitate with basic lead acetate T. S., ferric chloride T. S., and concentrated solution of sodium borate. It is not colored blue (absence of starch), or red (absence of dextrin) by iodine T. S., nor does it yield a brownish-black precipitate with ferric chloride T. S., or reduce alkaline cupric tartrate V. S. The powder contains few or no starch grains or fragments of vegetable tissues, and yields not more than 4 per cent. of ash. Sp. gr. 1.31 to 1.525.

Official Preparations.—Mucilago Acaciæ, Syrupus Acaciæ.

TRAGACANTHA, U. S.—Tragacanth.—A gummy exudation from *Astragalus gummifer* and from other species of *Astragalus* (Fam. *Leguminosæ*), consisting of 33 per cent. of bassorin, 53 per cent. soluble gum (not arabin), 11 per cent. water, 3 per cent. impurities; occurring either in flaky, leaf-like pieces or in tortuous, vermicular filaments, of a whitish color, somewhat translucent and resembling horn in appearance; hard, and more or less fragile, but difficult of pulverization unless exposed to a freezing temperature or thoroughly dried and powdered in a heated mortar; odorless; very little taste; sp. gr. 1.384; introduced into water, it absorbs a certain proportion, swells very much, and forms a soft, adhesive paste, but does not dissolve; agitated with an additional quantity of water, this paste forms a uniform mixture; but in the course of one or two days, the greater part separates, and is deposited, leaving a portion dissolved in a supernatant fluid; the gelatinous mass is turned blue by iodine, and the fluid portion is not precipitated by alcohol; wholly insoluble in alcohol. Tragacanth appears to be composed of two different constituents, one resembling acacia, soluble in water; the other insoluble, but swelling in water. The former differs from acacia in affording no precipitate with potassium silicate or ferric chloride.

Official Preparation.—Mucilago Tragacanthæ.

ULMUS, U. S.—Elm. (*Slippery Elm.*)—Contains a mucilage precipitated by alcohol and lead acetate.

Official Preparation.—Mucilago Ulmi.

SASSAFRAS MEDULLA, U. S.—Sassafras Pith.—Contains a delicate mucilage, which is not precipitated by alcohol.

Official Preparation.—Mucilago Sassafras Medullæ.

ALTHÆA, U. S.—Althæa. (*Marshmallow.*)—Contains a large quantity of mucilage, $C_{12}H_{20}O_{10}$, associated with *asparagin*, sugar, and starch.

LINUM, U. S.—Linseed.—Contains 15 per cent. mucilage, $C_{12}H_{20}O_{10}$, in the epithelium, and 20 to 35 per cent. fixed oil in the nucleus, besides resin, sugar, wax. etc. The mucilage is soluble in water, readily soluble in hot water, forming a thick, viscid liquid, precipitated by alcohol and subacetate of lead.

SUGARS AND SACCHARINE SUBSTANCES.

Sugars are organic bodies, having a sweet taste, generally of vegetable origin and crystallizable; of a neutral reaction; soluble in water, their solutions being optically active to polarized light.

Two Classes of Sugar.—Fermentable and non-fermentable sugars.

1. **FERMENTABLE SUGARS** are the most important, being largely consumed in food products. The fermentable sugars are divided into two sub-classes—*glucoses*, or sugars *directly* subject to vinous fermentations, and *saccharoses*, or sugars *indirectly* subject to vinous fermentation.

GLUCOSES, $C_6H_{12}O_6$.—The principal ones are—*glucose* (dextroglucose or dextrose), which rotates the plane of polarization strongly to the right; obtained by treating starch with H_2SO_4 and lime, and separating the $CaSO_4$, and evaporating the solution. *Grape sugar* (crystallized glucose); obtained by crystallizing the above solution. *Lævulose* (lævo glucose) rotates the plane of polarization strongly to the left; found in sugar cane. *Maltose*, $C_{12}H_{22}O_{11} + H_2O$; obtained by action of diastase on starch, etc.

GLUCOSE, $C_6H_{12}O_6$, is prepared by the action of dilute H_2SO_4 upon starch. It may also be obtained from candied sugar, grapes, and other sources. Glucose is the term applied to the syrupy preparation, grape sugar to the solid product. The process is as follows: Corn is first soaked in warm water, then ground with a stream of water, the starch washed from the meal in a trough with bolting cloth bottom, beaten with caustic soda, to separate the gluten, washed and treated with dilute H_2SO_4 and steam. The process is called "open conversion," and takes about two hours. Or the substances are acted upon with superheated steam in a closed cylinder. This is called "close conversion," and takes about fifteen minutes. After conversion, the substances are treated with marble dust and animal charcoal, filtered, and evaporated in *vacuo*.

Glucose can be obtained as a hydrate, in small and laminated crystals, from aqueous solutions, and anhydrous in hard, crystalline masses, either from alcoholic solutions or from very concentrated aqueous solutions.

Properties.—Less sweet than cane sugar; less soluble in water, more soluble in alcohol; sp. gr. 1.54–1.57, when anhydrous. Strong mineral acids act sparingly on it, but with facility on cane sugar. Alkalies readily destroy it, but form definite compounds with cane sugar. Boiled with water, it suffers very little alteration; rotates polarized light to the right; undergoes vinous fermentation directly; reduces alkaline tartrate of copper, producing a reddish precipitate.

SACCHAROSES, $C_{12}H_{22}O_{11}$.—The peculiar characteristic of sugars of this class is that they are fermentable only after being converted into glucoses.

Principal Saccharoses.—Cane sugar (saccharose), from sugar cane, sorghum, beets, etc.; para-saccharose, by fermenting spontaneously cane sugar; milk sugar (lactose, lactin), from milk.

2. **NON-FERMENTABLE SUGARS.** (Sometimes called saccharoids.)

Principal non-fermentable sugars. Mannite, $C_6H_{14}O_6$; dulcite, $C_6H_{14}O_6$; etc., etc.

SACCHARUM, U. S.—Sugar. $C_{12}H_{22}O_{11}$; 341.2. (*Cane Sugar.*)—The refined sugar obtained from *Saccharum officinarum*, and from various species or varieties of *Sorghum* (Fam. *Gramineæ*); also from one or more varieties of *Beta vulgaris* (Fam. *Chenopodiaceæ*); made, commercially, from sugar cane, sorghum, and beet root; occurring in white, dry, hard, distinctly crystalline granules; odorless; purely sweet taste; permanent in the air. Prepared by crushing and expressing sugar cane, adding calcium bisulphite and a little lime, heating, straining, evaporating, cooling, and stirring, transferring to casks perforated at the bottom, and the crystals drained. This is known as the open-pan process. The vacuum-pan process, which now almost completely displaces it, consists in removing the lime by CO_2, filtering through bone-black, concentrating in a vacuum pan, crystallizing, and drying the crystals in "centrifugals" by rapid revolutions.

The best sugar for pharmaceutical uses is granulated sugar, as it is not liable to absorb moisture, like loaf sugar, and does not lose weight when kept in dry air.

Rock Candy.—Crystallized sugar.

SACCHARUM LACTIS, U. S.—Sugar of Milk. See under Products from Animal Substances, p. 175.

MEL, U. S.—Honey.—A saccharine secretion deposited in the honeycomb by the bee, *Apis mellifica*, and occurring as a syrupy liquid, of a light yellowish to yellowish-brown color, translucent when fresh, gradually becoming opaque and crystalline; characteristic odor; sweet, faintly acrid taste.

MANNA, U. S.—Manna.—A concrete, saccharine exudation of *Fraxinus Ornus* (Fam. *Oleaceæ*). It deposits, from a boiling alcoholic solution, beautiful crystals of a peculiar, sweet principle, found in manna and many other plants, called *mannite*. Average dose, 10 Gm. (240 gr.).

GLYCYRRHIZA, U. S.—Glycyrrhiza. Licorice Root (*Liquorice Root*).— The dried rhizome of *Glycyrrhiza glabra* (Spanish Licorice), and of *G. glandulifera* (Russian Licorice) (Fam. *Leguminosæ*), containing the sweet principle *glycyrrhizin*, or *glycyrrhizic acid*, $C_{44}H_{63}NO_{18}$, existing in the root, in combination with ammonium. Average dose, 2 Gm. (30 gr.).

Official Preparations.—Extractum Glycyrrhizæ, Extractum Glycyrrhizæ Purum, Mistura Glycyrrhizæ Composita, Pulvis Glycyrrhizæ Compositus, Fluidextractum Glycyrrhizæ, Trochisci Glycyrrhizæ et Opii.

GLYCYRRHIZINUM AMMONIATUM, U. S.—Ammoniated Glycyrrhizin.—Made by percolating licorice root with water, adding H_2SO_4 as long as a precipitate is produced, and redissolving the precipitate in water with the aid of NH_4HO, and scaling. Yield, about 10 per cent. Average dose, 0.250 Gm. (4 gr.).

TRITICUM, U. S.—Triticum. (*Couch Grass.*)—Contains *triticin*, a principle resembling inulin, also glucose, levulose, etc.

Official Preparation.—Fluidextractum Tritici.

DERIVATIVES OF SUGAR THROUGH THE ACTION OF FERMENTS.

Fermentation.—Decomposition occurring in organic bodies on exposure to the action of moisture, air and a warm temperature, resulting in the formation of new products, called when the products are worthless or offensive, *putrefaction;* when useful, *fermentation.*

Two Classes into which Ferments are Divided.—Ferments are divided into two classes—organized, or physiological ferments (three classes, viz., mould growths, represented by *Penicillium glaucum;* yeast plants, or saccharomyces; and bacteria), and unorganized, or chemical ferments, like diastase, synaptase, myrosin, pepsin pancreatin, etc. The latter class produce "false" fermentation; the ferments are called *cryptolytes.*

Vinous Fermentation.—The decomposition of cane sugar into alcoh and carbon dioxide, which occurs when sugar is exposed to the action of water, air, and a warm temperature, and seems to be caused by a microscopic plant, which has been named *Torula cerevisiæ*.

Result of the Action of Dilute Acids and Ferments on Cellulin and Starch.—They are converted into alcohol or acetic acid:—

$$\underset{\substack{\text{Cellulose}\\\text{or Starch.}}}{(C_6H_{10}O_5)_3} + \underset{\text{Water.}}{H_2O} = \underset{\text{Maltose.}}{C_{12}H_{22}O_{11}} + \underset{\text{Starch.}}{O_6C_{10}H_5};$$

then,

$$\underset{\text{Maltose.}}{C_{12}H_{22}O_{11}} + \underset{\text{Starch.}}{C_6H_{10}O_5} + \underset{\text{Water.}}{2H_2O} = \underset{\text{Glucose.}}{(C_6H_{12}O_6)_3};$$

then,

$$\underset{\text{Glucose.}}{C_6H_{12}O_6} = \underset{\text{Alcohol.}}{(C_2H_5HO)_2} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{2CO_2}.$$

If the process is not stopped here, the alcohol is oxidized into acetic acid:—

$$\underset{\text{Alcohol.}}{C_2H_5HO} + \underset{\text{Oxygen.}}{O_2} = \underset{\text{Acetic Acid.}}{C_2H_4O_2} + \underset{\text{Water.}}{H_2O}.$$

The most important derivative of sugar through the action of a ferment is *alcohol*, usually obtained from whiskey by distillation.

The distilled products of vinous liquors forming the different ardent spirits of commerce are: *brandy*, from wine; *rum*, from fermented molasses; *whisky*, from cider, malted barley or rye; *Holland gin*, from malted barley and rye meal, with hops, and rectified from juniper berries; *common gin*, from malted barley, rye, or potatoes, and rectified from turpentine; *arrack*, from fermented rice.

The compounds derived from sugars may be considered under three heads: 1. Ethyl hydrate and oxide, and their preparations. 2. Preparations of the esters of the ethyl, methyl, and amyl series. 3. Aldehyd, its derivatives and preparations.

Ethyl Hydroxide and Oxide, and their Preparations.

Alcohol is a term used to designate a class of carbon compounds called *alcohols*. Alcohols are hydroxides of the radicals *ethyl*, *amyl*, etc., just as calcium hydrate is the hydrate of the metal calcium.

Ethers are the oxides of these radicals, just as the calcium oxide is the oxide of the metal calcium.

Esters, formerly called *compound ethers*, are analogous to the salts of metals, being formed by the decomposition of their alcohols by acids, as ethyl acetate, amyl nitrite, etc. Water is formed as one of the results of the decomposition.

The following reactions will illustrate the formation of *esters:*—

$$\underset{\substack{\text{Sodium}\\\text{Hydroxide.}}}{NaHO} + \underset{\substack{\text{Acetic}\\\text{Acid.}}}{HC_2H_3O_2} = \underset{\substack{\text{Sodium}\\\text{Acetate.}}}{NaC_2H_3O_2} + \underset{\text{Water.}}{H_2O}.$$

$$\underset{\substack{\text{Alcohol, or}\\\text{Ethyl Hydroxide.}}}{C_2H_5HO} + \underset{\substack{\text{Acetic}\\\text{Acid.}}}{HC_2H_3O_2} = \underset{\text{Ethyl Acetate.}}{C_2H_5C_2H_3O_2} + \underset{\text{Water.}}{H_2O}.$$

SPIRITUS FRUMENTI, U. S.—Whisky.—An alcoholic liquid obtained by the distillation of the mash of fermented grain,—such as Indian corn, rye, wheat, and barley, or their mixtures. Operations: 1. *Mashing*, by which the starch is converted into sugar. 2. *Fermentation*, or the production of the alcohol. 3. *Distillation*, or the separation of the crude spirit.

ALCOHOL, U. S.—A liquid composed of 92.3 per cent. by weight or about 94.9 per cent. by volume of Ethyl Alcohol [$C_2H_5OH = 45.70$] and 7.7 per cent. by weight of water. Sp. gr. 0.816 at 15.6° C. (60° F.), the standard temperature for alcohol, or 0.809 at 25° C. (77° F.). Boiling at 78° C. (124.4° F.), and usually obtained by distilling *whisky*, redistilling, and rectifying.

Impurities.—Alcohol is liable to contain *fusel oil*, or *amylic alcohol*, giving it a characteristic odor. It may be deprived of odor by treating it with potassium permanganate and redistilling.

ALCOHOL ABSOLUTUM, U. S.—Ethyl Alcohol, [$C_2H_5 . OH = 45.70$], containing not more than 1 per cent., by weight, of water. It should be kept in well-stoppered bottles or tin cans, in a cool place, remote from lights or fire. A transparent, colorless, mobile, and volatile liquid, of a characteristic, rather agreeable odor, and a burning taste. Very hygroscopic. Sp. gr.: not higher than 0.797 at 15.6° C. (60° F.); or 0.790 at 25° C. (77° F.).

It is prepared by separating the 11 per cent. of water from the strongest alcohol that can be made by distillation, by the use of recently burned lime, out of contact with the air, and redistilling *in vacuo*. Its freedom from water may be tested with anhydrous baryta, or by its forming a clear solution when mixed with an equal bulk of pure benzol.

ALCOHOL DILUTUM, U. S.—Diluted Alcohol.—A liquid composed of about 41.5 per cent. by weight or about 48.9 per cent. by volume of Ethyl Alcohol, and 58.5 per cent. of water; sp. gr. about 0.936 at 15° C. (59° F.), and 0.930 at 25° C. (77° F.). Alcohol, distilled water, each 500 Cc. or each 1 pint. Mix them. Or alcohol 408 Gm., water 500 Gm., 50 parts by weight; add enough distilled water to produce 92.3 parts by weight. Mix them.

Rule for Preparing Diluted Alcohol from Alcohol of any Higher Percentage.—"Divide the alcoholic percentage of the alcohol to be diluted by 45.5 and subtract 1 from the quotient. This gives the number of parts of water to be added to 1 part of the alcohol." All terms denote weight in this rule.

Result if Alcohol and Water are mixed together.—A rise in temperature and a contraction of volume takes place. (55 gallons of alcoh
gallons of water equal $96\frac{1}{4}$ gallons—a loss of $3\frac{3}{4}$ gallons.)

United States Proof Spirits.—*U. S. Proof Spirit* contains 50
by volume of absolute alcohol.

Whisky and brandy are referred to under Spiritus, Part II.

ÆTHER, U. S.—Ether. [Stronger Ether.]—A liq
of about 96 per cent., by weight, of absolute Ether, or
[$(C_2H_5)_2O$; 73.52], and about 4 per cent. of alcohol cont
water. A transparent, colorless, mobile liquid, having a

odor, and a burning and sweetish taste. Sp. gr. 0.716 to 0.717 at 25° C. (77° F.). Should be kept in partially filled well-stoppered containers, preferably tin cans, in a cool place, remote from lights or fire. Average dose, 1 Cc. (15 ♏). Made by acting on alcohol with H_2SO_4, between the temperatures of 130° and 137.7° C. (266° and 280° F.). The following reactions occur:—

$$\underset{\text{Alcohol.}}{C_2H_5HO} + \underset{\text{Sulphuric Acid.}}{H_2SO_4} = \underset{\text{Ethylsulphuric Acid.}}{C_2H_5HSO_4} + \underset{\text{Water.}}{H_2O};$$

then,

$$\underset{\text{Ethylsulphuric Acid.}}{C_2H_5HSO_4} + \underset{\text{Alcohol.}}{C_2H_5HO} = \underset{\text{Ether.}}{(C_2H_5)_2O} + \underset{\text{Sulphuric Acid.}}{H_2SO_4}.$$

It will be seen that the sulphuric acid is not consumed in the process, but is regenerated, so that theoretically the making of ether is continuous.

Official Preparations.—Spiritus Ætheris; Spiritus Ætheris Compositus (Hoffmann's Anodyne).

Substitute usually sold for Hoffmann's Anodyne.—After the rectification of crude ether, an additional distillate is obtained, consisting of ether and alcohol, impregnated with a little ethereal oil. This is "*doctored*" to conform to the taste, smell, etc., of Hoffmann's Anodyne, and may be detected by mixing it with water, with which it forms a clear solution, instead of the milky solution characterizing the genuine article. *Castor oil* is sometimes added to circumvent this test, which may be detected by mixing equal parts with water, and collecting the separated oil on filtering paper; castor oil leaves a permanent, greasy stain, distinguishing it from ethereal oil.

Preparations of the Esters of the Ethyl and Amyl Series.

OLEUM ÆTHEREUM, U. S.—Ethereal Oil.—A volatile liquid, consisting of equal volumes of heavy oil of wine and stronger ether, occurring as a transparent, nearly colorless liquid; of a peculiar, aromatic ethereal odor; a pungent, refreshing, bitterish taste; and a neutral reaction to dry litmus paper; sp. gr. 0.905 at 25° C. (77° F.). Made by distilling alcohol and sulphuric acid together at a temperature between 150° and 157° C. (302° and 314.6° F.), until the liquid ceases to come over, or until a black froth begins to rise in the retort; separating the yellow ethereal liquid and exposing it to the air for twenty-four hours, in a shallow capsule, transferring it to a wet filter, and washing with distilled water and draining, then adding an equal volume of stronger ether.

When alcohol is distilled with a large excess of sulphuric acid, there are produced heavy oil of wine, sulphurous acid, olefiant gas, and empyreumatic products. This occurs toward the close of the distillation, and the products generally separate into two layers, one consisting of water holding sulphurous acid in solution, and the other, of ether containing the heavy oil of wine. The heavy oil of wine [illegible] separating it from the other products, exposing for [illegible] to dispel the ether, and washing with water to fre [illegible] of sulphurous acid.

The above refers to the products formed in the latter stages of distillation. In the earlier stage, ethyl-sulphuric acid, $C_2H_5HSO_4$, is formed, which, during the process, is decomposed, so as to yield ether. But if there is a large excess of sulphuric acid present, the ethyl sulphuric acid is decomposed, so as to form a small quantity of heavy oil of wine. This is a mixture of ethyl sulphate, $(C_2H_5)_2SO_4$, ethyl sulphite, $(C_2H_5)_2SO_3$, with polymeric forms of ethylene, C_2H_4.

SPIRITUS ÆTHERIS NITROSI, U. S.—Spirit of Nitrous Ether. (*Sweet Spirit of Nitre.*)—An alcoholic solution of Ethyl Nitrite ($NO . OC_2H_5 = 74.51$] yielding, when freshly prepared and tested by the U. S. P. process, not less than 4 per cent. of Ethyl Nitrite. A clear, mobile, volatile, and inflammable liquid, of a pale yellowish or faintly greenish-yellow tint, having a fragrant, ethereal, and pungent odor, free from acridity, and a sharp burning taste. Sp. gr. about 0.823 at 25° C. (77° F.). Average dose, 2 Cc. (30 ♏). Prepared by distilling a mixture of alcohol, sulphuric acid, and sodium nitrite together, using a well-colored condenser, and a receiver surrounded by ice, connected air-tight, and further connected with a small vial containing water, into which the connecting tube dips. The distillation is then washed first with ice-cold water to remove any alcohol which may have passed over, and then with ice-cold solution of monohydrated sodium carbonate in distilled water to remove traces of acid, the ethereal layer separated and agitated with potassium carbonate to remove traces of water, and mixed with enough alcohol to make the mixture weigh twenty-two times the weight of the nitrous ether added.

In this process, ethyl nitrite is formed, and an ester is produced by substituting the acid radical NO_2 for the H of the hydroxyl in the alcohol. This is then preserved from decomposition by adding sufficient alcohol.

Reactions for producing ethyl nitrite from alcohol:—

$$\underset{\text{Alcohol.}}{2C_2H_5OH} + \underset{\substack{\text{Sodium}\\\text{Nitrite.}}}{2NaNO_2} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{H_2SO_4} = \underset{\text{Ethyl Nitrite.}}{2C_2H_5NO_2} + \underset{\substack{\text{Sodium}\\\text{Sulphate.}}}{Na_2SO_4} + \underset{\text{Water.}}{2H_2O};$$

Pure Ethyl Nitrite is pale yellow; has the smell of apples; boils at 18° C. (64.4° F.); sp. gr. 0.900 at 15° C. (60° F.).

Sweet spirit of nitre is never entirely free from aldehyd; it is apt to contain a large amount of it if carelessly prepared. Aldehyd readily oxidizes to acetic acid, rendering the preparation sour.

ÆTHER ACETICUS, U. S.—Acetic Ether. (*Acetate of Ethyl.*)—A transparent, colorless liquid, of a fragrant and refreshing, slightly acetous odor, and a peculiar and acetous burning taste. A liquid compound of about 90 per cent. by weight of Ethyl Acetate, [$CH_3CO . OC_2H_5 =$
per cent. of alcohol containing a little water. Should
cautions as Ether. Average dose, 1 Cc. (15 ♏).
25° C. (77° F.). Prepared by distilling sodium
uric acid together, shaking the distillate with

exsiccated sodium acetate, and re-distilling it. It is a solution of ethyl acetate and a mixture of alcohol and water:—

$$\underset{\substack{\text{Sodium}\\\text{Acetate.}}}{NaC_2H_3O_2} + \underset{\substack{\text{Ethyl-sulphuric}\\\text{Acid.}}}{C_2H_5HSO_4} = \underset{\text{Ethyl Acetate.}}{C_2H_5C_2H_3O_2} + \underset{\substack{\text{Acid Sodium.}\\\text{Sulphate.}}}{NaHSO_4}.$$

ETHYLIS CARBAMAS, U. S.—Ethyl Carbamate. $C_3H_7NO_2 =$ 88.42.—An ester of carbamic acid, $[CO(OC_2H_5)NH_2]$, obtained by the reaction of ethyl alcohol upon urea (carbamide) or one of its salts. It should be kept in well-stoppered bottles. Colorless, columnar crystals or scales, odorless, and having a cooling, saline taste. Average dose, 1 Gm. (15 gr.).

ETHYLIS CHLORIDUM, U. S.—Ethyl Chloride.—A haloid derivative, [Monochlor-Ethane, $C_2H_5Cl = 64.00$], prepared by the action of hydrochloric acid gas upon absolute ethyl alcohol. On account of its extreme volatility, it should be preserved in hermetically sealed glass tubes, and kept in a cool place, remote from lights or fire. A colorless, mobile, very volatile liquid, having a characteristic, rather agreeable odor, and a burning taste. Sp. gr.: 0.918 at 8° C. (45.4° F.). Slightly soluble in water, readily soluble in alcohol.

SULPHONMETHANUM, U. S.—Sulphonmethane. $C_7H_{16}S_2O_4 =$ 226.55. (*Sulphonal.*)—Diethylsulphonedimethylmethane, $[(CH_3)_2C(SO_2C_2H_5)_2]$, the product of the oxidation of the mercaptol obtained by the condensation of acetous with ethyl mercaptan, made by agitating mercaptol with a 5 per cent. solution of potassium permanganate until the color of the solution remains unchanged, thus showing that the oxidation is completed. The crystals are purified by redissolving in water or alcohol, evaporating the solution, collecting and drying. Colorless, prismatic crystals; inodorous and nearly tasteless; neutral reaction. Average dose, 1 Gm. (15 gr.).

SULPHONETHYLMETHANUM, U. S.—Sulphonethylmethane. (*Trional.*)—$C_8H_{18}S_2O_4 = 240.46$. Diethylsulphonemethylethylmethane, $[(CH_3)(C_2H_5)C(SO_2C_2H_5)_2]$, a product of the oxidation of the mercaptol obtained by the condensation of methylethylketone with ethylmercaptan. Prepared by the same process as that employed for making sulphonal except in making the mercaptol acetone is replaced by methylethylketone, thus substituting an ethyl for a methyl group. Colorless, lustrous, crystalline scales; odorless; bitter taste in aqueous solution; neutral reaction. Average dose, 1 Gm. (15 gr.).

AMYLIS NITRIS, U. S.—Amyl Nitrite.—[Amyl Nitris, Pharm. 1890.] A clear, yellowish liquid; ethereal, fruity odor; pungent, aromatic taste; neutral or slightly acid reaction; containing about 80 per cent. of amyl (chiefly iso-amyl) nitrite ($C_5H_{11}NO_2$; 116.24). Average dose, 0.2 Cc. (3 ♏). Prepared by acting on amylic alcohol with nitric acid, by which the latter is deoxidized into nitrous acid, which acts on amylic alcohol as follows:—

$$\underset{\substack{\text{Amylic}\\\text{Alcohol.}}}{C_5H_{11}HO} + \underset{\substack{\text{Nitrous}\\\text{Acid.}}}{HNO_2} = \underset{\substack{\text{Amyl}\\\text{Nitrite.}}}{C_5H_{11}NO_2} + \underset{\text{Wate}}{H_2O}.$$

Aldehyde, its Derivatives and Preparations.

Aldehyde (*al*cohol *dehyd*rogenatum) is a general term used to define a class of organic bodies. *Acetaldehyde* has a composition C_2H_4O, and is made by depriving alcohol, C_2H_6O, of two hydrogen atoms. This is effected by acting on alcohol with oxidizing agents.

PARALDEHYDUM, U. S.—Paraldehyde. $C_6H_{12}O_3$; 131.10.—A polymer of acetaldehyd [$CH_3 . COH = 43.70$]. A colorless, transparent liquid, having a strong, characteristic, but not unpleasant or pungent odor, and a burning and cooling taste. Average dose, 2 Cc. (30 ♏). It may be made by treating ethyl aldehyde with small quantities of either sulphur dioxide, HCl, carbonyl chloride or zinc chloride; almost complete conversion occurs, and by freezing the liquid and rectifying, pure paraldehyde is produced.

LIQUOR FORMALDEHYDI, U. S.—Solution of Formaldehyde. (*Formalin.*)—An aqueous solution, containing not less than 37 per cent., by weight, of absolute Formaldehyde, [$H . COH = 29.79$], an oxidation product of methyl alcohol. A clear, colorless liquid, having a pungent odor and caustic taste; its vapor acts as an irritant upon the mucous membrane. Sp. gr.: 1.075 to 1.078 at 25° C. (77° F.). The U. S. P. gives process for assay. Made by mixing the vapor of boiling methyl alcohol, which is under pressure, with air in proper quantity, and allowing the mixed vapors to pass over heated copper tubes, and then condensing the vapors by passing them into a copper tube provided with the means for cooling the temperature to 0° C. (32° F.). Sufficient water is then added to the product to make it contain 37 per cent. by weight of absolute formaldehyde.

HEXAMETHYLENAMINA, U. S.—Hexamethylenamine. $C_6H_{12}N_4 = 139.18$.—A condensation product, [Hexamethylenetetramine, $(CH_2)_6N_4$], obtained by the action of ammonia upon formaldehyde. Colorless, lustrous, odorless crystals, having, when in aqueous solution, an alkaline reaction upon red litmus paper. Average dose, 0.250 Gm. (4 gr.). Also called *urotropin*, *cystogen*, *formin*, etc.

CHLORALUM HYDRATUM, U. S.—Hydrated Chloral. $C_2HCl_3O + H_2O_2 = 164.12$. [Chloral, Pharm. 1890.] (*Chloral Hydrate.*)—A crystalline solid, composed of trichloraldehyde or chloral [$CCl_3 . COH$] with the elements of one molecule of water. It occurs in separate, rhomboidal, colorless, and transparent crystals, having an aromatic, penetrating, and slightly acrid odor; a bitterish, caustic taste; slowly volatilized when exposed to the air. Average dose, 1 Gm. (15 gr.). Prepared by passing dry chlorine gas, in a continuous stream, through absolute alcohol for six or eight weeks. The pure chloral thus formed is then mixed with the necessary amount of water, and the resulting hydrated chloral cast into cakes or purified by crystallization:—

$$C_2H_4H_2O + \underset{\text{Chlorine.}}{2Cl} = \underset{\text{Acetaldehyd.}}{C_2H_4O} + \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{2HCl;}$$

$$= \underset{\text{Chloral.}}{C_2HCl_3O} + \underset{\substack{\text{Hydrochloric}\\\text{Acid.}}}{3HCl.}$$

CHLORALFORMAMIDUM, U. S.—Chloralformamide. $C_3H_4Cl_3NO_2$ = 190.96. (*Chloramide.*)—A crystalline solid, $[CCl_3 . CH(OH)NH . COH]$, an addition product of chloral, CCl_3COH, and formamide, $CH(OH)NH$. Colorless, lustrous crystals, without odor, and having a somewhat bitter taste. Average dose, 1 Gm. (15 gr.).

CHLOROFORMUM, U. S.—Chloroform. [Chloroformum Purificatum, Pharm. 1880.]—A liquid, consisting of 99 to 99.4 per cent., by weight, of absolute chloroform, $[CHCl_3 = 118.45]$, and 0.6 to 1 per cent. of alcohol. A heavy, clear, colorless, mobile, and diffusible liquid, of a characteristic, ethereal odor, and a burning, sweet taste; sp. gr. not below 1.476 at 25° C. (77° F.); consisting of 99 to 99.4 per cent. by weight of absolute chloroform, and 1 to 0.6 per cent. of alcohol; neutral reaction. May be made by several processes, one of the most economical by reacting on acetone with chlorinated lime; the liquid products (ketones) resulting from the decomposition of crude acetates at high temperatures may also be used.

$$\underset{\text{Acetone.}}{2C_3H_6O} + \underset{\text{Calcium Hypochlorite.}}{6Ca(OCl)_2} = \underset{\text{Chloroform.}}{2CHCl_3} + \underset{\text{Calcium Hydroxide.}}{2Ca(OH)_2} + \underset{\text{Calcium Acetate.}}{Ca(C_2H_3O_2)_2} + \underset{\text{Calcium Chloride.}}{3CaCl_2}.$$

Chloroform can also be produced by substituting three atoms of chlorine for three hydrogen atoms of *methane*, marsh gas, CH_4. It is, therefore, chemically termed *trichlormethane*.

Purification of Chloroform.—Chloroform sometimes contains, as an impurity, a chlorinated pyrogenous oil, from which it may be purified by treating with H_2SO_4, dried Na_2CO_3, and distilling with deodorized alcohol. The pyrogenous oil is decomposed by the H_2SO_4, and, in turn, blackened by it; the chloroform is separated from the H_2SO_4, agitated with solution of Na_2CO_3, to neutralize adhering acid, then mixed with alcohol, to preserve it from decomposition, and redistilled from lime, to separate water.

Official Preparations.—Aqua Chloroformi, Spiritus Chloroformi, Emulsum Chloroformi, Linimentum Chloroformi.

BROMOFORMUM, U. S.—Bromoform.—A liquid consisting of 99 per cent., by weight, of absolute Bromoform, $[CHBr_3 = 250.99]$, and 1 per cent. of absolute alcohol. A heavy, transparent, colorless, mobile liquid, with an ethereal odor, and a penetrating, sweet taste, resembling that of chloroform. Made by the action of Br on alcohol in the presence of alkalies or alkali hydroxides, or preferably by the reaction of sodium hypobromite upon acetone, just as chloroform is made by the "acetone process." Average dose, 0.2 Cc. (3 ♍).

IODOFORMUM, U. S.—Iodoform. CHI_3 = 390.61.—Triiodomethane, usually obtained by the action of iodine upon alcohol, in the presence of an alkali or alkali carbonate. A fine lemon-yellow powder or lustrous crystals of the hexagonal system, having a pe
penetrating and persistent odor, and an unpleasant, sl
iodine-like taste. Average dose, 0.250 Gm. (4 gr.
ing alcohol, acid potassium carbonate, and

water, and passing chlorine gas through the mixture, to cause the separation of iodoform, which may be filtered out, and purified by washing with distilled water and drying (Filhol's Process):—

$$\underset{\text{Alcohol.}}{C_2H_5HO} + \underset{\text{Iodine.}}{8I} + \underset{\substack{\text{Acid Potassium}\\\text{Carbonate.}}}{2KHCO_3} =$$

$$\underset{\substack{\text{Potassium}\\\text{Iodide.}}}{2KI} + \underset{\text{Iodoform.}}{2CHI_3} + \underset{\text{Water.}}{3H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{2CO_2}.$$

Official Preparation.—Unguentum Iodoformi.

IODOLUM, U. S.—Iodol. $C_4H_4 . NH = 566.17$.—Tetraiodopyrrol, a derivative of the base pyrrol, obtained by the direct action of iodine upon the base in the presence of alcohol. A light grayish-brown, crystalline powder, without odor or taste. Made by dissolving pyrrol and iodine in alcohol and allowing the liquid to stand for twenty-four hours; the iodol which is formed is precipitated by the addition of water. Average dose, 0.250 Gm. (4 gr.).

PRODUCTS OF THE ACTION OF FERMENTS UPON ACID SACCHARINE FRUITS.

Important alcoholic liquids, which have received various names, according to the fruits from which they are derived, are formed by the action of ferment upon acid saccharine fruits.

Wine, from grapes; cider, from apples; perry, from pears, etc., occur by fermenting these fruits.

For a description of the official White and Red Wines see Vina, Part II.

The plant furnishing the grape is called *Vitis vinifera.* The juice of the fruit contains grape sugar, tannin, acid potassium tartrate, calcium tartrate, potassium sulphate, sodium chloride, pectin, albuminous principles, and water.

The aroma of wines depends upon the formation of certain compound ethers during the fermentation, and also during the ageing or ripening process.

Difference between Sweet and Dry Wine.—When the quantity of sugar in the juice is large, and the amount of ferment insufficient to convert it all into alcohol, *sweet* wine is produced. When the quantity of ferment is sufficient to convert all the sugar into alcohol, a strong, or generous, wine is formed. If only a moderate amount of sugar is present, with enough ferment to convert it all into alcohol, the wine is termed dry.

Sparkling Nature and Roughness.—Wine containing carbonic acid gas is called *sparkling;* when the gas is absent it is called *still.* When fermented with the seeds, it becomes rough and astringent, owing to the presence of tannic acid in the seeds.

ARGOL.—A precipitate of acid potassium tartrate, rendered impure by calcium tartrate, more or less coloring matter, and other matters de-
ed from the juice of the grape during fermentation and clarification.
cipitation is due to the fact that these matters, though soluble
ice, are insoluble in the dilute solution of alcohol formed by
ion.

SPIRITUS VINI GALLICI, U. S.—Brandy.—An alcoholic liquid obtained by the distillation of fermented grapes, and at least four years old. It should have a pale, amber color, a distinctive taste and odor, slightly acid reaction, and sp. gr. not above 0.941 nor below 0.925, corresponding, approximately, with the alcoholic strength of 39 to 47 per cent. by weight, or 46 to 55 per cent. by volume.

ACIDUM TARTARICUM, U. S.—Tartaric Acid. $H_2C_4H_4O_6$; 148.92.—A dibasic organic acid, $[C_2H_2(OH)_2(COOH)_2]$, usually prepared from argol. It should contain not less than 99.5 per cent. of pure Tartaric Acid. Colorless, translucent, monoclinic prisms, or crystalline crusts, or a white powder; permanent in the air; odorless; purely acid taste; acid reaction. Average dose, 0.500 Gm. (7½ gr.). Prepared by saturating the excess of acid in acid potassium tartrate or cream of tartar (prepared from *argol*) with calcium carbonate, and decomposing the resulting insoluble calcium tartrate by sulphuric acid, which precipitates it in combination with the lime, as calcium sulphate, and liberates the tartaric acid. Only one-half the tartaric acid is thus obtained. The remainder may be procured by decomposing the neutral potassium tartrate remaining in the solution after the precipitation of the calcium tartrate, by calcium chloride in excess. This may be decomposed by sulphuric acid, together with the first portion:—

$$\underset{\substack{\text{Acid Potassium}\\\text{Tartrate.}}}{2KHC_4H_4O_6} + \underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{CaCO_3} =$$

$$\underset{\substack{\text{Potassium}\\\text{Tartrate.}}}{K_2C_4H_4O_6} + \underset{\substack{\text{Calcium}\\\text{Tartrate.}}}{CaC_4H_4O_6} + \underset{\text{Water.}}{H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{CO_2};$$

then,

$$\underset{\substack{\text{Potassium}\\\text{Tartrate.}}}{K_2C_4H_4O_6} + \underset{\substack{\text{Calcium}\\\text{Chloride.}}}{CaCl_2} = \underset{\substack{\text{Calcium}\\\text{Tartrate.}}}{CaC_4H_4O_6} + \underset{\substack{\text{Potassium}\\\text{Chloride.}}}{2KCl},$$

and

$$\underset{\substack{\text{Calcium}\\\text{Tartrate.}}}{2CaC_4H_4O_6} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{2H_2SO_4} = \underset{\substack{\text{Calcium}\\\text{Sulphate.}}}{2CaSO_4} + \underset{\text{Tartaric Acid.}}{2H_2C_4H_4O_6}.$$

Official Preparation.—Pulvis Effervescens Compositus (Seidlitz Powder).

LIMONIS SUCCUS, U. S.—Lemon Juice.—Contains about 7 per cent. of citric acid. Average dose, 30 Cc. (1 fl. oz.).

ACIDUM CITRICUM, U. S.—Citric Acid. $H_3C_6H_5O_7 + H_2O$; 208.50.—A tribasic organic acid, $[CH_3H_4(OH)COOH)_3 + H_2O]$. It should contain not less than 99.5 per cent. of pure Citric Acid. Colorless, translucent, right-rhombic prisms; odorless; having an agreeable, purely acid taste; efflorescent in warm air and deliquescent when exposed to moist air. Obtained from the juice of limes and lemons, by saturating the boiling juice with calcium carbonate, and decomposing the resulting calcium citrate with sulphuric acid, concentrating, and crystallizing:—

$$\underset{\substack{\text{Citric Acid in}\\\text{Lemon Juice.}}}{2H_3C_6H_5O_7} + \underset{\substack{\text{Calcium}\\\text{Carbonate.}}}{3CaCO_3} = \underset{\text{Calcium Citrate.}}{Ca_3 2C_6H_5O_7} + \underset{\text{Water.}}{3H_2O} + \underset{\substack{\text{Carbon}\\\text{Dioxide.}}}{3CO_2};$$

then,

$$\underset{\text{Calcium Citrate.}}{\mathrm{Ca_3 2C_6H_5O_7}} + \underset{\text{Sulphuric Acid.}}{\mathrm{3H_2SO_4}} = \underset{\text{Citric Acid.}}{\mathrm{2H_3C_6H_5O_7}} + \underset{\text{Calcium Sulphate.}}{\mathrm{3CaSO_4}}.$$

Official Preparation.—Syrupus Acidi Citrici.

TAMARINDUS, U. S.—Tamarind.—The preserved pulp of the fruit of *Tamarindus indica*. Contains citric and tartaric acids and small quantities of malic acid. Used in preparing confection of senna.

RHUS GLABRA, U. S.—Rhus Glabra. (*Sumach.*)—Contains malic acid, which exists in it as calcium and potassium malate.

Official Preparation.—Fluidextractum Rhois Glabræ.

Acid Saccharine Fruits Containing Pectinous Bodies.

PECTIN.—A peculiar principle existing in certain fruits, and formed by the action of two other principles, *pectase* and *pectose*, upon each other during the process of ripening.

The moderate action of heat and water upon the fruits causes the citric, tartaric, or malic acid therein contained to act on the pectose, softening it and converting it into pectin. The pectin is then acted upon by the ferment *pectase*, which causes it to gelatinize on cooling, through the production of pectosic acid. This explains the formation of fruit jellies.

VOLATILE OILS.

Volatile or *essential* oils are odorous principles found in various parts of plants, pre-existing, or produced by the reaction of certain constituents when brought in contact with water; or sometimes formed through destructive distillation, as the oil of amber; or they may be obtained from the animal kingdom, as the oil from ambergris.

Four Classes into which Volatile Oils may be Divided.—First, Terpenes, or hydrocarbons, consisting of C and H, mostly with the formula $C_{10}H_{16}$; type, oil of turpentine. Second, Oxygenated oils, or hydrocarbons containing oxygen; type, oil of cinnamon. Third, Sulphurated oils, containing sulphur; type, volatile oil of mustard. Fourth, Nitrogenated oils, a small class, containing hydrocyanic acid; type, oil of bitter almond.

Two Proximate Principles of which Volatile Oils Consist.—*Stearopten* and *eleopten*, the former congealing at a lower temperature than the latter. Some of the stearoptens are called camphors.

Action of Light and Air on Volatile Oils.—The fragrance of the oil is destroyed, *ozone* is developed, and the oils thicken, resinify, or deposit crystalline compounds.

Action of Acids and Alkalies on Volatile Oils.—Strong nitric acid decomposes them with great rapidity; some oils react with iodine with explosive violence. Alkalies, with the exception of a few oils with which they form chemical compounds, have, generally, but little effect on volatile oils.

Principal Adulterations.—*Fixed oil:* detected by dropping the suspected oil on a piece of filtering paper; if a fixed oil is present, the stain will not evaporate on gently heating. *Alcohol:* detected by shaking in a graduated tube, with glycerin or water, which takes up the alcohol and decreases the volume of oil. Or if a large quantity of alcohol has been used, by setting fire to a small portion in a dish in a dark room, when the lambent blue flame of burning alcohol will be seen, in contrast to the yellow, sooty flame of volatile oil. Other tests are metallic sodium, calcium chloride, and aniline red. *Volatile oils, or cheaper grades of the same oil, or a cheaper oil having a similar odor:* test, by the olfactories.

Preparation.—Volatile oils are usually prepared from plants, and generally, either by distillation with water, distillation *per se*, expression, or solution.

1. *Distillation with Steam.*—Put the substance from which the oil is to be extracted into a still, and add enough water to cover it; then distill, by a regulated heat, into a large refrigeratory. Separate the distilled oil from the water which comes over with it.

2. *Distillation per se.*—Distillation "by itself," or without the use of water. Ex.: Certain oleoresins, copaiba, etc.

3. *Expression.*—The volatile oil of orange will illustrate this process. The advantage is, that heat is not employed; but the disadvantage is, that expressed oils have a small portion of albumin, which renders them turbid.

4. *Solution or Absorption.*—This operation is effected by maceration, digestion, percolation with carbon bisulphide or similar solvent, enfleurage, or the pneumatic process. Used in cases where the oils are so delicate that they are decomposed by distillation, and exist in such small proportion in the plant that it does not pay to express them.

Maceration.—This is accomplished by allowing the odorous portion of a plant to stand in contact with a bland, inodorous, fixed oil. The oil absorbs the odor, and, after a certain length of time, it is strained. The odorous fixed oil is generally used in perfumes.

Digestion.—Similar to maceration, except moderate heat is employed.

Enfleurage.—A cold process, and much used for delicate flowers; conducted by sprinkling the flowers on thin layers of purified, inodorous fat spread on glass. The glasses are fixed in frames resembling window sashes. The frames are piled in a stack, and left undisturbed for twelve hours or three or four days.

When strong pomade is desired, fresh flowers are added from time to time, as long as absorption continues, and the pomades are known commercially as Nos. 6, 12, 18, and 24, which indicate their strength. When the volatile oils are desired, they are extracted from the pomade by macerating the latter, in a finely chopped condition, in pure alcohol; afterward separating the small amount of fatty matter dissolved by the alcohol, by refrigerating and filtering.

Pneumatic Process.—Used only with very delicate volatile oils. It consists in forcing a current of air through a vessel filled with fresh flowers, into another vessel containing melted purified fat, with revolving circular plates half immersed therein. These circular plates become coated with fat, and absorb the odor from the perfumed air.

Percolation.—Odorous flowers are percolated with purified carbon disulphide. The latter is distilled, thus separating it from the volatile oil.

Official Products from the Rutaceæ.

Aurantii Dulcis Cortex. (*Syr.; Tr.*) **Aurantii Amari Cortex.** (*Fldext.; Tr.*) **Oleum Aurantii Corticis.** (*Spts. Comp.*) **Aurantii Florum.*** (*Aq.; Aq. Fort.; Syr.*) **Limonis Cortex.** (*Tr.*) **Oleum Limonis.**

Official Products from the Labiatæ.

Menthol, U. S.—*Menthol.* $C_{10}H_{19}OH$; 154.98.—A secondary alcohol, $[C_6H_9(CH_3)(OH)(C_3H_7)\ 1:3:4]$, obtained from the oil from *Menthæ piperita*, or other peppermint oils; colorless, acicular, or prismatic crystals, having a strong and pure odor of peppermint, and a warm, aromatic taste, followed by a sensation of cold when air is drawn into the mouth. Average dose, 0.065 Gm. = 65 Mg. (1 gr.).

Mentha Piperita. Oleum Menthæ Piperitæ. (*Aq.; Spts.*) **Mentha Viridis. Oleum Menthæ Viridis.** (*Aq.; Spts.*) **Oleum Lavandulæ Florum.** (*Tr. Comp.; Spts.*) **Oleum Rosmarini. Hedeoma** (*Pennyroyal*). **Oleum Hedeomæ. Marrubium** (*Horehound*). (Contains a volatile oil associated with resin, and a bitter principle, *Marrubiin.*) **Oleum Thymi. Salvia** (*Sage*). (Contains a volatile oil, which consists of a terpene, $C_{10}H_{16}$, and an oxygenated portion, *salviol*, $C_{10}H_{18}O$.) **Scutellaria** (*Skullcap*). (Contains a volatile oil, tannin, and a bitter principle.) (*Fldext.*)

Official Products of the Aromatic Umbelliferæ.

Sumbul, U. S.—*Sumbul.*—The dried rhizome and root of an undetermined plant, probably of the family *Umbelliferæ*, contains about 0.5 per cent. of a volatile oil and about 10 per cent. of a resinous compound having a musky odor. Average dose, 2 Gm. (30 gr.). (*Ext.; Fldext.*)

Oleum Anisi, U. S.—*Oil of Anise.*—A volatile oil distilled from Anise or from the fruit of Star Anise (*Illicium Verum*, Fam. *Magnoliaceæ*). At 10° to 15° C. (50° to 59° F.) it solidifies to a crystalline mass, which does not resume its fluidity until the temperature rises to about 17° C. (62.6° F.). *Oil of Illicium* (*Star Anise*) has nearly the same properties, except that it congeals at about 2° C. (35.6° F.). It consists of a small quantity of hydrocarbon, $C_{10}H_{16}$, but mainly of *anethol*, $C_{10}H_{12}O$, which is present in two modifications—one, solid at ordinary temperatures and heavier than water (*anise camphor, solid anethol*), the other liquid and more volatile (*liquid anethol*). *Anethol*, both in the liquid and in the solid form, is present, and is the chief constituent of the oils of *anise, star anise*, and *fennel*. Average dose, 0.2 Cc. (3 ♏).

Official Preparations.—Aqua Anisi, Spiritus Anisi.

Carum. Oleum Cari. Fœniculum (*Fennel*). **Oleum Fœniculi** (*Aqua*). **Coriandrum.** (Furnishes about 1 per cent. of agreeable, aromatic oil, also about 10 per cent. of fixed oil.) **Ole** **Coriandri. Anisum.**

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* The flowers are not official; the preparations are.

Official Aromatic Products, with their Volatile Oils.

Oleum Cinnamomi. Oil of Cinnamon. Oil of Cassia. From Cassia Cinnamon (Fam. *Lauraceæ*). This oil consists of ***cinnamic aldehyd***, C_9H_8O, which, by moderate oxidation, yields the corresponding cinnamic acid, $C_9H_8O_2$, but by more energetic oxidation, yields benzoic acid, $C_7H_6O_2$.

Oil of Ceylon cinnamon, when it is not very fresh, contains cinnamic acid in sufficient quantity to give a permanent cloudiness to cinnamon water made from it.

Official Preparations.—Aqua Cinnamomi, Spiritus Cinnamomi.

Cinnaldehydum, U. S.—*Cinnamic Aldehyde.* (*Synthetic Oil of Cassia.*) C_9H_8O = 132.07.—An aldehyde obtained from Oil of Cinnamon, or prepared synthetically, containing not less than 95 per cent. of pure Cinnamic Aldehyde, [C_6H_5 . CH : CH . COH]. It is nearly identical with the oil distilled from Cassia Cinnamon. A colorless liquid, having a cinnamon-like odor and a burning, aromatic taste. Average dose, 0.05 Cc. (1 ♏).

Eugenol, U. S.—*Eugenol.* $C_{10}H_{12}C_2$ = 162.86.—An unsaturated, aromatic phenol, [$C_6H_3(OH)(OCH_3)$, C_3H_5 4 : 3 : 1], obtained from Oil of Cloves and other sources. A colorless, or pale yellow, thin liquid, having a strongly aromatic odor of cloves, and a pungent and spicy taste. Exposure to air causes it to become darker and thicker. Sp. gr.: 1.072 to 1.047 at 25° C. (77° F.). Average dose, 0.2 Cc. (3 ♏).

Vanilla, U. S.—*Vanilla.*—The cured, full-grown, but immature fruit of *Vanilla planifolia* (Fam. *Orchidaceæ*). Contains a trace of a volatile oil, 10 per cent. of fixed oil, resin, sugar, etc., and ***vanillin***, $C_8H_8O_3$.

Official Preparation.—Tinctura Vanillæ.

Vanillinum, U. S. — *Vanillin.* $C_8H_8O_3$ = 150.92. — Methylprotocatechuic aldehyde, [C_6H_3 . OH . OCH_2 . COH 4 : 3 : 1], occurring naturally in Vanilla, or made artificially from several orthodihydroxybenzene derivatives. Fine, white, crystalline needles, having the odor and taste of vanilla, and having an acid reaction. Average dose, 0.030 Gm. (½ gr.).

Eucalyptol, U. S.—*Eucalyptol.* $C_{10}H_{18}O$; 152.78.—An organic oxide (cineol), obtained from the volatile oil of *Eucalyptus Globulus* (Fam. *Myrtaceæ*), and from other sources. A colorless liquid, having a characteristic, aromatic, and distinctly camphoraceous odor, and a pungent, spicy, and cooling taste. Average dose, 0.3 Cc. (5 ♏).

Saffrolum, U. S.—*Safrol.* $C_{10}H_{10}O_2$ = 160.86.—The methylene ether of allylpyrocatechol, [C_6H_3 . $C_3H_5(OOCH_2)$ 1 : 3 : 4], found in oil of sassafras, camphor oil, and other volatile oils, purified, if necessary, by repeated chilling and crystallization. A colorless or faintly yellow liquid with a sassafras-like odor. Average dose, 3 Cc. (5 ♏).

Oleum Gaultheriæ, U. S.—*Oil of Gaultheria.* (*Oil of Wintergreen.*)—It is the heaviest of all the volatile oils, having the sp. gr. 1.172 to 1.180 at 25° C. (77° F.). It is an almost colorless liquid, having a characteristic, strongly aromatic odor; a sweetish, warm, and aromatic taste. Oil of Wintergreen is nearly identical with Volatile Oil of Betula.

Official Preparation.—Spiritus Gaultheriæ.

Oleum Betulæ. *(Oil of Sweet Birch.)*—A volatile oil obtained by distillation from the bark of *Betula lenta*. It is identical with Methyl Salicylate, $CH_3C_7H_5O_3$, and nearly identical with Oil of Gaultheria.

Methylis Salicylas, U. S.—*Methyl Salicylate.* $CH_3C_7H_5O_3 =$ 150.92. (*Artificial* (*or Synthetic*) *Oil of Wintergreen.*)—An ester, [$C_6H_4(OH)COOCH_3$ 1 : 2], produced synthetically; it is the principal constituent of Oil of Gaultheria and Oil of Betula. For flavoring purposes, Oil of Gaultheria, Oil of Betula, and Methyl Salicylate may be regarded as identical products. A colorless liquid, having a characteristic, strongly aromatic wintergreen odor and a sweetish, warm, and aromatic taste. Average dose, 1 Cc. (15 ♏).

Cinnamomum Saigonicum. (*Tr.*) **Cinnamomum Zeylanicum** (*Ceylon Cinnamon*). **Caryophyllus** (*Cloves*). **Oleum Caryophylli. Pimenta** (*Allspice*). **Oleum Pimenta. Oleum Cajuputi. Eucalyptus.** (Contains a volatile oil, resin, etc.) (*Fldext.*) **Oleum Eucalypti. Myristica** (*Nutmeg*). **Oleum Myristicæ.** (*Spts.*) Oil of Mace is a fixed oil made by expressing nutmegs between hot plates, or macerating them in carbon disulphide and distilling.) **Sassafras. Oleum Sassafras. Calamus.** (Contains a volatile oil, having the composition of a terpene, $C_{10}H_{15}$, soft resin, a bitter principle, *acorin*, starch, and mucilage.) (*Fldext.*) **Cardamomum.** (Contains 5 per cent. of an oxygenated volatile oil, 10 per cent. of fixed oil, starch, mucilage, etc. (*Tr.; Tr. Comp.*) **Zingiber** (*Ginger*). (Owes its virtues to about 4 per cent. of volatile oil (terpene), having the composition $C_{10}H_{16}$, and a soft, pungent, aromatic resin, which is soluble in alcohol and ether.) (*Fldext.; Oleores.; Syr.; Tr.*)

Stearoptens from Volatile Oils.

Camphora, U. S.—*Camphor.* $C_{10}H_{16}O$; 150.98.—The dextrogyrate modification of the saturated ketone, [$C_9H_{16}CO$], obtained from *Cinnamomum Camphora* (Fam. *Lauraceæ*) and purified by sublimation. It occurs in white, translucent masses, of a tough consistence and crystalline structure; readily pulverizable in the presence of a little alcohol, ether, or chloroform, having a penetrating, characteristic odor, and a pungent, aromatic taste. Average dose, 0.125 Gm. (2 gr.).

Official Preparations.—Aqua Camphoræ, Ceratum Camphoræ, Linimentum Camphoræ, Spiritus Camphoræ.

Acidum Camphoricum, U. S.—*Camphoric Acid.* $H_2C_{10}H_{14}O_4 =$ 198.62.—A dibasic organic acid, [$C_8H_{14}(COOH)$], obtained by the oxidation of camphor. Colorless, odorless, monoclinic prismatic crystals or plates; soluble in 125 parts of water at 25° C. (77° F.), and in 10 parts of boiling water; readily soluble in alcohol, less soluble in ether and chloroform; soluble in fatty oils. Average dose, 1 Gm. (15 gr.).

Camphora Monobromata, U. S.—*Monobromated Camphor.* C
BrO; 229.34.—A substitution product of camphor, [C_9H_1.B
Colorless, prismatic needles or scales, permanent in the a
affected by light; mild but characteristic camphoraceous od
neutral to litmus paper. Made by heating camphor

together, cooling, dissolving the crystalline mass in petroleum benzine, and recrystallizing. Average dose, 0.125 Gm. (2 gr.).

Official Substances Containing Nitrogenated and Sulphurated Oils, with Allied Products.

Amygdala Amara, U. S.—*Bitter Almond.*—The ripe seed of *Amygdalus Prunus*, var. *amara* (Fam. *Rosaceæ*), containing a glucoside called *amygdalin*, which splits into benzyl-aldehyd, or oil of bitter almond, hydrocyanic acid and glucose, under the influence of *emulsin*, or *synaptase*, a ferment, which becomes active in the presence of water:—

$$\underset{\substack{\text{Crystallized}\\ \text{Amygdalin.}}}{C_{20}H_{27}NO_{11}} + \underset{\text{Water.}}{3H_2O} =$$

$$\underset{\text{Dextro-glucose.}}{2(C_6H_{12}O_6)} + \underset{\substack{\text{Hydrocyanic}\\ \text{Acid.}}}{HCN} + \underset{\substack{\text{Oil of}\\ \text{Bitter Almond.}}}{C_7H_6O} + \underset{\text{Water.}}{H_2O.}$$

Oleum Amygdalæ Amaræ, U. S.—*Oil of Bitter Almonds.*—A volatile oil obtained from Bitter Almond and other seeds containing *amygdalin*, yielding, when assayed by the U. S. P. process, not less than 85 per cent. of benzaldehyde, and not less than 2 per cent. of hydrocyanic acid. A clear, colorless or yellow, thin and strongly refractive liquid, having a peculiar, aromatic odor; a bitter and burning taste.

Preparation.—The bitter almond cake obtained after extracting the fixed oil is mixed with water, and distilled by passing a current of steam through it. The emulsin reacts on the amygdalin in presence of the aqueous vapor, and oil of bitter almond, or benzyl-aldehyd, is produced:—

$$\underset{\text{Amygdalin.}}{C_{20}H_{27}NO_{11}} + \underset{\text{Water.}}{2H_2O} = \underset{\substack{\text{Benzyl-}\\ \text{Aldehyd.}}}{C_7H_6O} + \underset{\text{Glucose.}}{2C_6H_{12}O_6} + \underset{\substack{\text{Hydrocyanic}\\ \text{Acid.}}}{HCN.}$$

As sweet almond does not contain amygdalin, oil of bitter almond cannot be prepared from it.

Official Preparation.—Aqua Amygdalæ Amaræ; Spiritus Amygdalæ Amaræ; Syrupus Amygdalæ.

Benzaldehydum, U. S.—*Benzaldehyde.* $C_7H_6O = 105.25$. *Synthetic Oil of Bitter Almonds.*—An aldehyde, produced artificially, or obtained from natural oil of bitter almond or other oils, and containing not less than 85 per cent. of pure Benzaldehyde, [$C_6H_5 . COH$]. A colorless, strongly refractive liquid, having a bitter-almond-like odor, and a burning, aromatic taste. Sp. gr. about 1.045 at 25° C. (77° F.). Average dose, 0.03 Cc. (½ ♏).

Artificial benzyl aldehyd is made by the action of chlorine upon hot toluene, C_7H_8. Benzyl chloride, $C_6H_5CH_2Cl$, and benzal chloride, C_6H_5-$CHCl_2$, results, and these yield benzyl aldehyd on treatment with manganese dioxide and other oxidizing agents.

Oil of Myrbane, or nitro-benzol, is an entirely different prod
by reacting on benzol with nitric acid. Its odor is si
identical with, oil of bitter almond. It is used for

Prunus Virginiana, U. S.—*Wild Cherry* *serotina* (Fam. *Rosaceæ*), collected in autumn, and carefully dried and preserved, contains *amygdalin*, emulsin, tannin, bitter principle, starch, etc., and furnishes the same reaction with water, with the production of oil of bitter almond and hydrocyanic acid, as bitter almond.

Official Preparations.—Infusum Pruni Virginianæ, Syrupus Pruni Virginianæ, Fluidextractum Pruni Virginianæ.

Acidum Hydrocyanicum Dilutum, U. S.—*Diluted Hydrocyanic Acid.* (*Prussic Acid.*)—A colorless liquid, of a characteristic odor and taste, resembling bitter almonds; composed of 2 per cent. absolute hydrocyanic acid (HCN; 26.84) and 98 per cent. of alcohol and water. It should be kept in a small, dark, amber-colored, cork-stoppered vial in a cool place. Average dose, 0.1 Cc. (1½ ♏). Made by distilling together potassium ferrocyanide, diluted alcohol, and sulphuric acid, and diluting to the proper strength with distilled water:—

$$\underset{\substack{\text{Potassium}\\\text{Ferrocyanide.}}}{(K_4FeCy_6)_2} + \underset{\substack{\text{Sulphuric}\\\text{Acid.}}}{(H_2SO_4)_6} =$$

$$\underset{\substack{\text{Potassium}\\\text{Ferrous}\\\text{Ferrocyanide.}\\\text{(Everitt's Salt.)}}}{K_2Fe_2Cy_6} + \underset{\substack{\text{Potassium}\\\text{Acid Sulphate.}}}{(K_2SO_4)_6} + \underset{\substack{\text{Hydrocyanic}\\\text{Acid.}}}{6HCy.}$$

Scheele's Hydrocyanic Acid is a stronger solution, containing about 5 per cent. anhydrous acid.

Sinapis Alba, U. S.—*White Mustard.*—The seed of *Sinapis alba* (Fam. *Cruciferæ*) contains *sinalbin*, $C_{30}H_{44}N_2O_{16}S_2$, a crystalline glucoside which, under the influence of a peculiar ferment, *myrosin*, and water, is split into *acrinyl thiocyanate*, C_8H_7NOS, which is a pungent, volatile oil (this is not the official oil of mustard), *sinapine sulphate*, $C_{16}H_{23}NO_5H_2SO_4$, and glucose. The seed contains, in addition, 20 per cent. of fixed oil, mucilage, gum, etc., but no starch.

Sinapis Nigra, U. S.—*Black Mustard.*—The seed of *Brasica nigra* (Fam. *Cruciferæ*) contains potassium myronate ($KC_{10}H_{18}NS_2O_{10}$), *myrosin*, a ferment, 25 per cent. of fixed oil, mucilage, etc. Under the influence of the myrosin and water, the potassium myronate is converted into allyl iso-thiocyanate, or volatile oil of mustard. This action takes place at ordinary temperatures, and explains the pungency of aqueous mixtures of ground mustard.

Official Preparation.—Charta Sinapis—Mustard Paper.

Oleum Sinapis Volatile, U. S.—*Volatile Oil of Mustard.*—A volatile oil obtained from black mustard by maceration with water, and subsequent distillation, yielding, when assayed by the U. S. P. process, not less than 92 per cent. of allyl iso-thiocyanate.

Chemically, this oil is *allyl isothiocyanate* or *allyl thiocarbamide;* it is also called *sulphocyanide of allyl.* It is prepared artificially by distilling
de with *potassium sulphocyanate.* It is a colorless or pale-yellow,
strongly refractive liquid, having a very pungent and acrid
ution should be exercised when handling this oil.

OFFICIAL DRUGS AND PRODUCTS CONTAINING VOLATILE OIL WITH SOFT RESIN.

Piper, U. S.—*Pepper.* Contains *piperine*, a feeble alkaloid, 2 per cent. volatile oil (a terpene, $C_{10}H_{16}$), a pungent resin.

Piperina, U. S.—*Piperine*, $C_{17}H_{19}NO_3$; 283.04.—A feebly basic substance, $[CH_2O_2 . C_6H_3 . CH : CH . CH : CH . CON . C_5H_{10}]$, obtained from Pepper and other plants of the *Piperaceæ.* Colorless or pale-yellowish, glistening, monoclinic crystals, permanent in the air; odorless. When put into the mouth, it is at first tasteless, but on prolonged contact it develops a sharp, biting taste. Average dose, 0.200 Gm. (3 gr.).

Piperin is decomposed by alkalies in alcoholic solution into *piperic acid*, $C_{12}H_{10}O_4$, and *piperidine*, $C_5H_{11}N$.

Cubeba, U. S.—*Cubeb.*—The dried unripe but fully grown fruit of *Piper Cubeba* (Fam. *Piperaceæ*) contains about 10 per cent. of volatile oil, 3 per cent. of resin, cubebin, *cubebic acid*, wax, fat, etc. (*Fldext.; Oleores.; Troch.; Tr.*)

Capsicum. (*Cayenne Pepper. African Pepper.*)—Contains *capsaicin*, $C_9H_{14}O_2$, which occurs in colorless crystals, volatile, intensely acrid, and soluble in alcohol, ether, and fixed oils. Capsicum also contains traces of a volatile alkaloid and a volatile oil, fixed oil, resin, coloring matter, etc. (*Emp.; Fldext.; Oleores.; Tr.*)

Copaiba, U. S.—*Copaiba. Balsam of Copaiba.*)—An oleoresin, derived from one or more South American species of *Copaiba* (Fam. *Leguminosæ*), which contains *copaivic acid*, volatile oil, and a bitter principle. Copaivic acid, $C_{20}H_{30}O_2$, the resinous mass left after distilling the oil, forms a series of amorphous salts.

Serpentaria, U. S.—*Serpentaria.* (*Virginia Snakeroot.*)—The dried rhizome and root of *Aristolochia Serpentaria* (Virginia Serpentaria) and of *Aristolochia reticulata* (Texas Serpentaria) (Fam. *Aristolochiaceæ*), contain 1 per cent. of volatile oil, a bitter principle, starch, sugar, etc. (*Fldext.; Tr.*)

Matico. (Contains about 2 per cent. of volatile oil, a pungent resin, a crystalline principle, *artanthic acid*, and tannin.) (*Fldext.*) **Oleum Cubebæ.** **Oleum Copaiba.** **Oleum Santali** (*Oil of Sandal Wood*). **Buchu.** (Contains a volatile oil and resin, a bitter principle, mucilage, etc. The stearopten *diosphenol* is colored dark green by ferric chloride.) (*Fldext.*) **Humulus** (*Hops*). (Contains a small quantity of volatile oil; their bitterness is due to the resin and lupulin present.) **Lupulinum.** (Contains 10 per cent. of volatile oil, which, on exposure, yields valerianic acid, trimethylamine, a bitter principle (lupamaric acid), $C_{82}H_{70}O_7$, resin, wax, and an alkaline liquid termed *Cupuline.*) (*Fldext.; Oleores.*) **Cannabis Indica** (*Indian Hemp*). (Contains a resinous substance, *cannabinine*, volatile oil, and tetano-cannabinine.) (*Ext.; Fldext.; Tr.*) **Valeriana.** (Contains about 1 per cent. of volatile oil, valerianic acid, resin, etc.; there are also present some acetic and formic acids.) (*Fldext.; Tr.; Tr. Val. Am.*) **Viburnum Opulus** (*Cramp*

Bark). (*Fldext.*) **Viburnum Prunifolium** (*Black Haw*). (Contains valerianic acid, a bitter, resinous principle, *viburnin*. (*Fldext.*) **Sambucus** (*Elder*). (Contains a little volatile oil and resin, etc.) **Oleum Chenopodii** (*Oil of American Wormseed*). **Oleum Juniperi.** (*Spts.; Spts. Comp.*) **Sabina** (*Savine*). (Contains a terpene, $C_{10}H_{16}$, and resin, with a trace of tannin.) (*Fldext.*) **Oleum Sabinæ.**

Official Drugs and Products containing Volatile Oil Associated with Bitter Principle or Extractive.

Arnica. (Contains a trace of volatile oil, and a bitter principle, *arnicin*, with resin, etc. (*Tr.*) **Calundula** (*Marigold*). (Contains a small quantity of a volatile oil, a bitter principle, etc. *Calendulin* is not the active principle, having very little taste.) (*Tr.*) **Oleum Erigerontis** (*Oil of Fleabane*). **Anthemis** (*Chamomile*). (Contains a volatile oil and a bitter principle, which has been called *anthemic acid*.) **Matricaria** (*German Chamomile*). (Contains a dark-blue volatile oil; the bitter principle is termed *anthemic acid*.) **Eupatorium** (*Thoroughwort, Boneset*). (Contains a volatile oil and resin, *eupatorin*, etc.) (*Fldext.*) **Grindelia.** (Contains a volatile oil and a bitter and resinous principle.) (*Fldext.*) **Eriodictyon** (*Yerba Santa*). (Contains a bitter resin, volatile oil, etc.) (*Fldext.*) **Mezereum.** (Contains *daphnin*, $C_{31}H_{34}O_{19}$, a glucoside, associated with an acrid, soft resin, and oil.) (*Fldext.*) **Aspidium** (*Male Fern*). (Contains *filicic acid*, $C_{14}H_{18}O_5$, filix red, filitannic acid, fixed oil, etc.) (*Oleores.*) **Cypripedium** (*Lady's Slipper*). (Contains resins, an acrid principle, volatile oil, tannin, starch, etc.) (*Fldext.*) **Phytolacca** (*Poke Root*). (Contains an acrid resin, tannin, etc.) (*Fldext.*) **Zea** (*Corn Silk*). (Contains, when dried, maizenic acid, fixed oil, resin, etc.) **Stillingia** (*Queen's Root*). (Contains an acrid resin, starch, fixed oil, gum, etc.) (*Fldext.*) **Pyrethrum** (*Pellitory*). (Contains an acrid, brown resin, and fixed oils, inulin, mucilage, etc.) (*Tr.*) **Xanthoxylum** (*Prickly Ash*). (Contains a soft resin, a crystalline resin, a bitter principle, and an acrid, green oil.) (*Fldext.*) **Sabal** (*Saw Palmetto*). (Contains a volatile oil, fixed oil, resin, and an alkaloid principle.) **Cimicifuga** (*Black Snakeroot*). (Contains resin, an acrid principle (possibly an alkaloid), starch, tannin, gum, etc.) (*Ext.; Fldext.; Tr.*) **Apocynum** (*Canadian Hemp*). (Contains resin, *apocynin*, *apocynein*, bitter extractive, tannin, etc.) (*Fldext.*) **Lactucarium.** (Contains a bitter resinous principle, *lactucin*, $C_{11}H_{12}O_3.H_2O$, *lacturic acid* (bitter and crystalline), *lactucopicrin* (bitter and amorphous), *lactucerin* in large quantity, nearly 60 per cent. (this principle is inert and crystallizable), caoutchouc, resin, asparagin, volatile oil, mucilage, etc.) (*Tr.*)

RESINS, OLEORESINS, GUM-RESINS, AND BALSAMS.

Resins: Natural or induced, solid or semi-solid exudations from plants, characterized by being insoluble in water, mostly soluble in alcohol, uncrystallizable, and softening and melting at a moderate heat.

What they are chemically: Mixed products. Some of them are acids, and combine with alkalies, forming soaps, as in the case of common resin. They are commonly the oxidized terpenes of plants.

Description: When pure, they are usually transparent, hard, and brittle; when they contain water, are opaque and no longer hard, and brittle.

Three Classes: Natural Oleoresins (oil and resin), generally obtained by incising the trunks of trees which contain them; ex., turpentine. Gum resins; natural mixtures of gum and resin—usually exudations from plants; ex., myrrh. Balsams: resinous substances which contain benzoic, cinnamic, or analogous acids; ex., balsam of tolu.

Terebinthina.—*Turpentine.* (Contains abietic anhydride, which may be converted into abietic acid, $C_{44}H_{64}O_5$, a bitter principle, and 25 per cent. of volatile oil.) **Oleum Terebinthinæ.** (Has the composition $C_{10}H_{16}$, and is the type of the terpenes.) (*Linimentum.*) **Oleum Terebinthinæ Rectificatum.** (*Emulsum.*)

Terebenum, U. S.—*Terebene.*—A liquid consisting of dipentine and other hydrocarbons, obtained by the action of concentrated H_2SO_4 on oil of turpentine and subsequent rectification with steam. A colorless, thin liquid, having a rather agreeable, thyme-like odor, and an aromatic, somewhat terebinthinate taste; sp. gr. about 0.850 at 25° C. (77° F.). Average dose, 0.5 Cc. (8 ♏).

Terpini Hydras, U. S.—*Terpin Hydrate.* $C_{10}H_{20}O_2 + H_2O$; 188.74. The hydrate $[C_{10}H_{18}(OH)_2 + H_2O]$ of the diatomic alcohol terpin. Colorless, lustrous, rhombic prisms, nearly odorless, and having a slightly aromatic and somewhat bitter taste. Permanent in the air. Made by acting on a mixture of oil of turpentine with nitric acid. Average dose, 0.125 Gm. (2 gr.).

Resina, U. S.—*Rosin.* (*Colophony.*)—The residue left after distilling off the volatile oil from turpentine consists of abietic anhydride, which passes into abietic acid when treated with diluted alcohol. It is a transparent, amber-colored substance, hard, brittle, with a glossy and shallow conchoidal fracture, and having a faintly terebinthinate odor and taste; sp. gr. 1.070 to 1.080.

Official Preparations.—Ceratum Resinæ, Ceratum Resinæ Compositum.

Terebinthina Canadensis, U. S.—*Canada Turpentine.* (*Balsam of Fir.*)—A liquid oleoresin obtained from *Abies balsamea* (Fam. *Coniferæ*). It contains resin, associated with a terpene, $C_{10}H_{16}$, and a small quantity of a bitter principle. It is a viscid, pale yellowish or greenish-yellow, transparent liquid; odor agreeable; taste terebinthinate, bitter and slightly acrid.

Mastiche, U. S.—*Mastic.*—A concrete, resinous exudation from *Pistacia Lentiscus* (Fam. *Anacardiaceæ*), containing a resin (mastichic acid, $C_{20}H_{32}O_2$), which is soluble in strong alcohol; also masticin, a resinous principle, which is insoluble in alcohol; a small quantity of volatile oil is likewise present. Average dose, 2 Gm. (30 gr.).

Asafœtida, U. S.—*Asafetida.*—A gum resin obtained from the root of *Ferula fœtida*, and probably other species of *Ferula* (Fam.

Umbelliferæ). It contains a sulphurated volatile oil (ferulyl sulphide), about 20 per cent. of gum, and 70 per cent. of resin. Average dose, 0.250 Gm. (4 gr.).

Official Preparations.—Emulsum Asafœtidæ, Tinctura Asafœtidæ, Pilulæ Asafœtidæ.

Elastica, U. S.—*India Rubber.* (*Caoutchouc.*)—The prepared milk-juice of various species of *Hevea* (Fam. *Euphorbiaceæ*), known in commerce as Para Rubber.

Myrrha, U. S.—*Myrrh.*—A gum resin obtained from *Commiphora Myrrha* (Fam. *Burseraceæ*), contains 3 per cent. of an oxygenated volatile oil, a bitter principle, and about 30 per cent. of gum and 60 per cent. of resin.

Official Preparation.—Tinctura Myrrha.

Guaiacum, U. S.—*Guaiac.* [Guaiaci Resina, Pharm. 1890.] —The resin of the wood of *Guaiacum officinale* and of *G. sanctum* (Fam. *Zygophyllaceæ*) consists of *guaiacic acid* ($C_{12}H_{16}O_6$), *guaiaconic acid* ($C_{19}H_{20}O_5$), *guaiaretic acid* ($C_{20}H_{26}O_4$), beta resin, gum, etc. Average dose, 1 Gm. (15 gr.).

Official Preparations.—Tinctura Guaiaci, Tinctura Guaiaci Ammoniata.

Balsamum Peruvianum, U. S.—*Balsam of Peru.*—A balsam obtained from *Toluifera Pereira* (Fam. *Leguminosæ*) contains *cinnamic* and *benzoic acids, benzyl cinnamate,* $C_9H_7(C_7H_7)O_2$, resin, *benzyl benzoate*, stilbene, etc. Average dose, 1 Gm. (15 gr.).

Balsamum Tolutanum, U. S.—*Balsam of Tolu.*—A balsam obtained from *Toluifera Balsamum* (Fam. *Leguminosæ*), contains *cinnamic* and *benzoic acids*, resins, a volatile oil called *benzyl benzoate*, $C_7H_5(C_7H_7)O_9$, *benzyl cinnamate*, a terpene, $C_{10}H_{16}$, termed *tolene*, and other unimportant constituents. Average dose, 1 Gm. (15 gr.).

Official Preparations.—Tinctura Tolutana, Syrupus Tolutanus.

Benzoinum, U. S.—*Benzoin.*—A balsamic resin obtained from *Styrax Benzoin*, and another unidentified species of Styrax (Fam. *Styraceæ*), contains benzoic acid, cinnamic acid, ($C_9H_8O_2$), a fragrant, volatile oil, and resins; in some varieties vanillin is found. Average dose, 1 Gm. (15 gr.).

Official Preparations.—Adeps Benzoinatus, Tinctura Benzoini, Tinctura Benzoini Composita.

Styrax, U. S.—*Storax.*—The balsam prepared from the inner bark of *Liquidambar orientalis* (Fam. *Hamamelidaceæ*) contains cinnamic acid, benzoic acid, *styracin*, $C_9H_7(C_9H_9)O_2$, *storesin*, $C_{36}H_{58}O_3$, *ethyl cinnamate*, $C_9H_7(C_2H_5)O_2$; *phenyl propyl cinnamate*, $C_9H_7(C_9H_{17})O_2$, *styrol*, C_8H_8, a fragrant hydrocarbon, and a resinous substance not yet investigated.

Acidum Benzoicum, U. S.—*Benzoic Acid.* $HC_7H_5O_2$; 121.13. —An organic acid, [$C_6H_5 . COOH$], obtained from Benzoin by sublimation, or prepared artificially. It should be kept in dark amber-colored, well-stoppered bottles, in a cool place. White, or yellowish-white, lustrous scales, or friable needles, permanent in the air; nearly odorless, or having a slight characteristic odor resembling that of benzoin, an acid, pungent taste, somewhat volatile at a moderately warm temperature, and acquiring a yellow color on exposure to light. Soluble in 281 parts of water, and in 1 part of boiling alcohol; also soluble in 3 parts of ether, 7 parts of chloroform, and readily soluble in carbon-disulphide, benzene, fixed and volatile oils; sparingly soluble in petroleum benzin. Average dose, 500 Gm. = 500 Mg. (7½ gr.). It is found natural in benzoin, balsam of tolu, etc., but is usually made artificially—

1. From the urine of cattle, by treating it with lime, evaporating, decomposing the lime hippurate with HCl, purifying the hippuric acid with animal charcoal, and treating with HCl, when benzoic acid and glycocine are produced:—

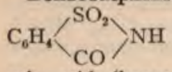
$$\underset{\text{Hippuric Acid.}}{C_9H_9NO_3} + \underset{\text{Water.}}{H_2O} = \underset{\text{Benzoic Acid.}}{C_7H_6O_2} + \underset{\text{Glycocine.}}{C_2H_5NO_2}.$$

2. From *naphtalin*, $C_{10}H_8$, by treating it with HNO_3; *phthalic* acid is produced which, when treated with excess of $Ca(HO)_2$, yields calcium benzoate and carbonate. The calcium benzoate is treated with HCl, and the benzoic acid is precipitated.

3. From *toluene*. Benzotrichloride is first formed, and this, when treated with water in close vessels, yields benzoic acid:—

$$\underset{\text{Benzotrichloride.}}{C_6H_5.CCl_3} + \underset{\text{Water.}}{H_2O} = \underset{\text{Benzoic Acid.}}{C_6H_5.COOH} + \underset{\text{Hydrochloric Acid.}}{3HCl}.$$

Benzosulphinidum, **U. S.** — *Benzosulphinide.* *Saccharin.*



$C_6H_4\left\langle\begin{matrix}SO_2\\CO\end{matrix}\right\rangle NH$ = 181.77.—The anhydride of ortho-sulphamide-benzoic acid (benzoyl sulphonic-imide). A white, crystalline powder, nearly odorless, having an intensely sweet taste even in dilute solutions. Made from the coal-tar product, toluene, by converting it into toluene-sulphonic chloride. This is treated with ammonia whereby the sulphamide is formed, which by oxidation is converted into the sulphimide, saccharine being the anhydride of ortho-sulphamide-benzoic acid. Average dose, 0.200 Gm. (3 gr.).

FIXED OILS, FATS, AND SOAPS.

Source of Fixed Oils and Fats, and how Distinguished: They are obtained from both the vegetable and animal kingdoms. *Characteristics:*—Greasy to the touch; leave a permanent oily stain on paper; insoluble in water, but soluble in ether, chloroform, carbon disulphide, benzol, benzin, turpentine, and volatile oils, usually mixing with one another without separating; when pure, generally colorless or of a pale yellow color, with distinctive odor and taste, often caused by impurities, as they are rendered odorless and tasteless by refining them. When heated moderately, if solid, they melt; if liquid they become thinner; decomposed by heating strongly in the air [illegible] tion of offensive vapors, they burn with a sooty flame and much heat. Sp. gr. 0.870 to 0.985. On exposure to air, they acquire an acrid, disagreeable taste and acid reaction, owing to a change that occurs, termed rancidity, believed to be due to impurities, like albuminous substances, which act as ferments, induce decomposition, liberate the fatty acids, and produce volatile, odorous acids, like caproic, caprylic, butyric, and valerianic acids. Rancid oils may often be purified by shaking thoroughly with hot water, then with a cold solution of CO_2, and washing with cold water.

What they are chemically: They are esters of higher members of the fatty acids, the alcohol being glycerin and the radical glyceryl. They are sometimes called glycerides of oleic, palmitic, and stearic acids. Olein is liquid, the other two solid. Almond oil being principally composed of olein, is, at ordinary temperatures, liquid; tallow, being largely stearin, is solid at the same temperatures.

Olein: The oleate of the triad radical glyceryl, having the chemical composition $C_3H_5(C_{18}H_{33}O_2)_3$, obtained by treating oils or fats with boiling alcohol, cooling, to deposit the concrete principles, the olein remaining in solution, which is obtained by evaporating off the alcohol, or by compressing one of the solid fats, or a liquid fat concreted by cold, between folds of bibulous paper, which absorb the olein and give it up afterward by compressing under water.

Olein is a liquid of oily consistence, congealing at —6° C. (21.2° F.); colorless, when pure; with little odor and a sweetish taste; insoluble in water, soluble in boiling alcohol and ether.

Palmitin: The glyceride of palmitic acid, or tripalmitate of glyceryl.

Stearin: A glyceride of stearic acid, $C_3H_5(C_{18}H_{30}O_2)_3$, and has been formed synthetically by heating a mixture of these two materials to 280°–300° C. A white, opaque mass, of a pearly appearance as crystallized from ether, pulverizable, fusible at 66.5° C. (152° F.), soluble in boiling alcohol and ether, nearly insoluble in those liquids cold, insoluble in water. Prepared by dissolving suet in hot oil of turpentine, cooling, expressing with unsized paper, dissolving in hot ether, which deposits the stearin on cooling.

Margarin: A mixture of stearin and palmitin—once regarded as a principle.

Stearic Acid: A firm, white solid, like wax, with chemical composition $C_{18}H_{86}O_2$, fusible at 69.2° C. (157° F.), greasy to the touch, pulverizable, soluble in alcohol, very soluble in ether, insoluble in water.

Palmitic Acid: Palmitic acid, $C_{16}H_{32}O_2$, forms a white, scaly mass, melting at 62° C. (143.6° F.).

Oleic Acid: An oily liquid, $C_{18}H_{34}O_2$, soluble in alcohol and ether, lighter than water, in which it is insoluble; crystallizable in needles at a temperature a little below zero C. (32° F.); having a slight smell and pungent taste; chemical composition, $C_{18}H_{34}O_2$.

Oleum Ricini, U. S.—*Castor Oil.*—A fixed oil expressed from the seed of *Ricinus communis.*

Preparation.—Castor oil has been obtained from the seed in four ways: 1. By cold expression; 2. By expression with heat; 3. By percolation with alcohol; 4. By decoction. The first method produces the best oil.

It is an almost colorless, transparent, viscid liquid, of a faint, mild odor; a bland, afterward slightly acrid, and generally offensive taste, and a neutral reaction; sp. gr. 0.950 to 0.970. It contains ***ricinolein*** and palmitin.

Acidum Oleicum, U. S.—*Oleic Acid.* $HC_{18}H_{33}O_2$; 280.14.—A monobasic organic acid, prepared in a sufficiently pure condition by cooling commercial oleic acid to about 5° C. (41° F.), then separating and preserving the liquid portion. A yellowish or brownish-yellow oily liquid, lard-like odor and taste, becoming darker and absorbing oxygen on exposure to air. Sp. gr. 0.895 at 25° C. (77° F.). Obtained as a by-product in the manufacture of candles from fats.

Red oil is crude oleic acid.

Acidum Stearicum, U. S.—*Stearic Acid.* $HC_{18}H_{35}O_2 = 282.14$.—A monobasic organic acid, $[C_{17}H_{35} . COOH]$, in its commercial, more or less impure form, usually obtained from the more solid fats, chiefly tallow. A hard, white, somewhat glossy solid, odorless and tasteless, and permanent in the air. Insoluble in water; soluble in about 16.6 parts of alcohol at 25° C. (77° F.); readily soluble in boiling alcohol and ether. Used for making Suppositoria Glycerini.

Glycerinum, U. S.—*Glycerin, Glycerole.*—A liquid obtained by the decomposition of vegetable and animal fats, or fixed oils, and containing not less than 95 per cent. of absolute Glycerole, a triatomic alcohol, $[CH_2OH . CHOH . CH_2OH = 91.37]$. Average dose, 4 Cc. (1 fl. dr.). A clear, colorless liquid, of thick, syrupy consistence, smooth to the touch; odorless; sweet to the taste and producing a sensation of warmth upon the mouth and lips; when exposed to the air, it absorbs moisture. Sp. gr. not less than 1.246 at 25° C. (77° F.). (*Glyc. Gelatin; Suppos.*)

Preparation.—Glycerin is made in several ways.

1. Through the saponification of fats and oils, in making soap or lead plaster:—

$$\underset{\substack{\text{Glyceryl Oleate}\\\text{(Olive Oil).}}}{2(C_3H_{5}3C_{18}H_{33}O_2)} + \underset{\substack{\text{Lead Oxide}\\\text{(Litharge).}}}{3PbO} + \underset{\text{Water.}}{3H_2O} =$$

$$\underset{\substack{\text{Lead Oleate}\\\text{(Lead Plaster).}}}{3(Pb2C_{18}H_{33}O_2)} + \underset{\substack{\text{Glyceryl Hydrate}\\\text{(Glycerin).}}}{2(C_3H_{5}3HO).}$$

2. By the decomposition of fats and oils through pressure and superheated steam, whereby the fats, which are *glycerides*, or ethers of the fatty acids, are broken up into glycerin and fatty acids, the water supplying the elements of hydrogen and oxygen necessary for that change. The decomposition of *stearin* in this way will illustrate:—

$$\underset{\text{Stearin.}}{C_3H_{5}3C_{18}H_{35}O_2} + \underset{\text{Water.}}{3H_2O} = \underset{\text{Glycerin.}}{C_3H_{5}3HO} + \underset{\text{Stearic Acid.}}{3H_{18}CH_{35}O_2.}$$

In this, its present form, it is known as *distilled glycerin*

Sapo, U. S.—*Soap.* (*White Castile Soap.*)-
sodium hydroxide and olive oil. It is a

yet easily cut when fresh; having a faint, peculiar odor, free from rancidity; disagreeable, alkaline taste; alkaline reaction.

Official Preparations.—Emplastrum Saponis, Linimentum Saponis.

Sapo Mollis, U. S.—*Soft Soap.* [Sapo Viridis, Pharm. 1880.] (*Green Soap.*)—A soft soap, originally imported from Germany; prepared from Linseed Oil 400 Gm.; Potassium Hydroxide 95 Gm.; Alcohol 40 Cc.; Water q. s.; and saponifying by the aid of heat. A soft, unctuous, yellowish-brown mass, having a characteristic odor and an alkaline taste; alkaline reaction.

Official Preparation.—Linimentum Saponis Mollis.

Amygdala Dulcis. (Contains about 40 per cent. of fixed oils, protein compounds (*conglutin* and *amandin*), sugar, mucilage, etc.) (*Emulsum.*) **Oleum Amygdalæ Expressum.** (Consists principally of olein, 70 per cent.) **Oleum Olivæ.** **Oleum Gossypii Seminis** (*Cotton-seed Oil*). **Oleum Lini** (*Linseed Oil*). **Pepo** (*Pumpkin Seed*). **Oleum Tiglii** (*Croton Oil*). **Oleum Theobromatis** (*Butter of Cacao*). (A fixed oil expressed from the seed of *Theobroma Cacao.* It should be brittle at temperatures below 15° C. (59° F.), and should melt at 30° to 35° C. (86° to 95° F.) to a clear liquid.) **Lycopodium.** (Contains 47 per cent. of fixed oil, with minute quantities of volatile bases.)

Unsaponifiable Fats and Petroleum Products.

Petrolatum, U. S.—*Petrolatum.* [Petrolatum Molle, Petrolatum Spissum, Pharm. 1890.] A mixture of hydrocarbons, chiefly of the methane series, obtained by distilling off the lighter and more volatile portions from petroleum, and purifying the residue. An unctuous mass of about the consistency of ointment, varying in color from yellowish to light amber, having not more than slight fluorescence, even after being melted; transparent in thin layers, completely amorphous; without odor or taste, but giving off, when heated, a faint petroleum-like odor.

The degree of hardness of petrolatum is due to the greater or less proportion of paraffin present.

Petrolatum is known commercially as *cosmoline, vaseline, petrolina, deodorolina*, etc. Liquid Petrolatum, as *albolene*, etc., etc.

Petrolatum Album, U. S.—*White Petrolatum.*—A colorless mixture of hydrocarbons, chiefly of the methane series, obtained by distilling off the lighter and more volatile portions from petroleum, and purifying the residue. A white unctuous mass, of about the consistency of an ointment; transparent in thin layers; completely amorphous, without odor or taste.

Petrolatum Liquidum, U. S.—*Liquid Petrolatum.*—A mixture of hydrocarbons, chiefly of the methane series, obtained by distilling off most of the lighter and more volatile portions from petroleum, and purifying the liquid residue. A colorless, or very slightly yellowish, nsparent liquid; without odor or taste, but giving off, when faint odor of petroleum. Sp. gr. 0.870 to 0.940 at 25° C.

, U. S.—*Paraffin.*—A mixture of solid hydrocarbons, chiefly of the methane series; usually obtained by chilling and pressing the distillates from petroleum having high boiling-points, and purifying the solid press cake so obtained. A colorless, more or less translucent mass, crystalline when separating from solution; without odor or taste, and slightly greasy to the touch.

Benzinum, U. S.—*Petroleum Benzin.* (*Petroleum Ether.*)—A transparent, colorless, diffusive liquid, with a strong, characteristic odor, slightly resembling that of petroleum, but much less disagreeable; neutral reaction. It is a purified distillate from American petroleum, consisting of hydrocarbons, chiefly of the marsh-gas series (C_5H_{12}, C_6H_{14}, and homologous compounds), having a sp. gr. from 0.638 to 0.660.

Benzin should be carefully kept in well-stoppered bottles or cans, in a cool place, remote from lights or fire, for it is highly inflammable, and its vapor, when mixed with air and ignited, explodes violently.

Benzinum Purificatum, U. S.—*Purified Petroleum Benzin.*—Petroleum Benzin purified by treating it with H_2SO_4, potassium permanganate and sodium hydroxide. Should not leave greasy stain, or disagreeable, sulphuretted odor, when evaporated from filter paper.

DRUGS CONTAINING GLUCOSIDES OR NEUTRAL PRINCIPLES, WITH THEIR PREPARATIONS.

Glucosides are bodies mostly found in plants yielding glucose, $C_6H_{12}O_6$, as one of their products of decomposition, when brought in contact with diluted acids or ferments. The other product which is formed at the same time differs in character from the original glucoside. Thus, *Salicin*, if boiled with diluted sulphuric acid, yields dextro-glucose and *saligenin*, or *saligenol*:—

$$\underset{\text{Salicin.}}{C_{13}H_{18}O_7} + \underset{\text{Water.}}{H_2O} = \underset{\text{Saligenin.}}{C_7H_8O_2} + \underset{\text{Glucose.}}{C_6H_{12}O_6}.$$

Glucosides may sometimes be split into glucose and the derived product by heating them with baryta water or alkaline solutions, by nitrogenous principles, which act as ferments, like *emulsin* or *synaptase*, or by treatment with yeast ferment or *ptyalin* found in saliva.

Glucosides are sometimes the active principles of the plants in which they are found, but they are more frequently associated with resins, oils, alkaloids, and bitter principles.

Scilla, U. S.—*Squill.*—The bulb of *Urginea maritima* (Fam. *Liliaceæ*), deprived of its dry, membranaceous outer scales, cut into thin slices and carefully dried, the central portions being rejected, contains the bitter principle *scillipicrin*, *scillitoxin*, *scillin*, and *scillain*, a poisonous glucoside. There are also present a large quantity of mucilage, calcium oxalate, sinistrin, etc.

Official Preparations.—Acetum Scillæ, Fluidextractum Scillæ, Syrupus Scillæ, Syrupus Scillæ Compositus, Tinctura Scillæ.

Digitalis, U. S.—*Digitalis.* (*Foxglove.*)—The dried leaves of *Digitalis purpurea* (Fam. *Scrophulariaceæ*), collected from plants of the second year's growth at the commencement of flowering. Average dose, 0.065 Gm. (1 gr.).

Digitalis has been the subject of exhaustive investigation. The principle digitalin was at one time considered to be an alkaloid. It is, as usually seen, a mixture of digitoxin and other neutral principles. Digitoxin is converted into *toxiresin* by the action of diluted acids and heat.

Official Preparations.—Infusum Digitalis, Fluidextractum Digitalis, Extractum Digitalis, Tinctura Digitalis.

Strophanthus, U. S.—*Strophanthus.*—The ripe seed of *Strophanthus Kombé* (Fam. *Apocynaceæ*) deprived of its long awn, contains a glucoside, *strophanthin*, which yields, on decomposition, glucose and *strophanthidin*.

Official Preparation.—Tinctura Strophanthi.

Strophanthinum, U. S.—*Strophanthin.*—A glucoside, or mixture of glucosides, obtained from Strophanthus. A white or faintly yellowish crystalline powder, containing varying amounts of water of crystallization, which it does not lose entirely without decomposition. Taste, intensely bitter; great caution should be used in testing it. Permanent in the air. Average dose, 0.0003 Gm. ($\frac{1}{200}$ gr.).

Santoninum, U. S.—*Santonin.* $C_{15}H_{18}O_3$; 244.29.—The inner anhydride or lactone of santonic acid, obtained from Santonica. Colorless, shining, flattened rhombic prisms; odorless, and nearly tasteless when first put into the mouth, but afterward developing a bitter taste; permanent in the air, but turning yellow on exposure to light. Average dose, 0.065 Gm. (1 gr.). Prepared by exhausting santonica mixed with lime with diluted alcohol, distilling off the alcohol and adding acetic acid to the residue. The precipitated santonin is purified by dissolving it in alcohol, treating with animal charcoal, and crystallizing. (*Trochisci.*)

Ergota, U. S.—*Ergot.* (*Ergot of Rye.*)—The sclerotium of *Claviceps purpurea*, replacing the grain of *Secale cereale* (Fam. *Graminaceæ*). Owes its activity to *sclerotic acid*, *sclererythrin*, *scleromucin*, *scleroiodin*, and *picrosclerotin;* there is also present *scleroxanthin* and *sclerocrystallin* (Kobert believes its activity is due to *cornutine*, *ergotic acid*, and *sphacelic acid*), with 25 per cent. of fixed oil, mycose, and protein compounds.

Ergot should be only moderately dried. It should be preserved in a close vessel, and a few drops of chloroform should be dropped upon it from time to time, to prevent the development of insects. When more than one year old it is unfit for use.

Official Preparations.—Fluidextractum Ergotæ, Extractum Ergotæ, Vinum Ergotæ.

Gentiana (*Gentian*). (Contains the glucoside *gentiopicrin* (which splits, when heated with dilute acids, into gentiogenin and grape sugar), *gentisic* acid, $C_{14}H_{10}O_5$, pectin, sugar (gentianose), and a little fixed oil.) (*Fldext.; Ext.; Tr.*) **Calumba** (*Columbo*). (Owes its virtue to *colombin*, $C_{21}H_{22}O_7$, and *berberine*, both of which are very bitter; starch and colombic acid are present, with a mucilage which is often troublesome by interfering with percolating operations.) (*Fldext.; Tr.*) **Quassia.**

(Contains *quassin*, $C_{10}H_{12}O_3$, which is intensely bitter and soluble in both alcohol and water; there are also present resin, mucilage, etc.) (*Fldext.; Ext.; Tr.*) **Chirata.** (Contains a bitter glucoside, *chiratin*, $C_{26}H_{48}O_{15}$, and a very bitter principle, ophelic acid, $C_{13}H_{20}O_{10}$.) (*Fldext.*) **Salicinum** (*Salicin*). (A glucoside, obtained from several species of *Salix* and *Populua*, which splits into saligenin and sugar under the influence of dilute acids and heat.) **Taraxacum** (*Dandelion*). (Owes its bitterness to *taraxacin*, $C_8H_{16}O$, an acrid crystalline principle, soluble in alcohol and water; it also contains pectin, sugar, resin, gum, etc.) (*Fldext.; Ext.*) **Lappa** (*Burdock*). (Contains a bitter substance, *inulin*, sugar, mucilage, etc.) (*Fldext.*) **Convallaria** (*Lily of the Valley*). (Contains a glucoside, *convallarin*, which is split into *convalleretin* by the action of dilute acids. Also contains the glucoside *convallamarin*, which is the active principle.) (*Fldext.*) **Cusso** (*Brayera*). (Contains a bitter resinous principle, *kosin*, tannin, gum, sugar, etc.) **Santonica** (*Levant Wormseed*). (Contains about 2 per cent. of *santonin*, resin, volatile oil, gum, etc.) **Gossypii Cortex** (*Cotton Root Bark*). (Contains a yellow resin, which becomes red upon exposure to air, fixed oil, tannin, starch, sugar, etc.) **Santalum Rubrum** (*Red Saunders*). (Contains *santalic acid*, a resinous substance, *pterocarpin*, and *santol*.)

Drugs Containing Saponified Principles, with their Preparations.

Quillaja. (*Soap Bark.*) (Owes its action to a peculiar principle, *saponin*, $C_{32}H_{54}O_{18}$, a glucoside, splitting upon heating with dilute acids into *sapogenin* and sugar.) (*Fldext.; Tr.*)

Sarsaparilla, U. S.—*Sarsaparilla.*—The dried root of *Smilax medica*, *Smilax ornata*, *Smilax papyraceæ*, or a dried root known commercially as Honduras Sarsaparilla, which is probably obtained from *Smilax officinalis*, contains a glucoside analogous to, if not identical with, saponin, termed *parillin*. When boiled with dilute acids, it splits into *parigenin* and grape sugar.

Official Preparations.—Fluidextractum Sarsaparillæ, Fluidextractum Sarsaparillæ Compositum, Syrupus Sarsaparillæ Compositus.

Senega, U. S.—*Senega.*—The dried root of *Polygala senega* (Fam. *Polygalaceæ*). Senega contains *polygallic acid* (sometimes called *senegin*), fixed oil, pectose, etc. Polygallic acid is analogous to, if not identical with, saponin. Liquid preparations of senega are very apt to gelatinize, owing to the presence of pectin; this is obviated by using water of ammonia, or other alkali, to dissolve it.

Official Preparations.—Fluidextractum Senegæ, Syrupus Senegæ.

Drugs Containing Cathartic Principles, and their Preparations.

Senna, U. S.—*Senna.*—The dried leaflets of *Cassia acutifolia* (Alexandria Senna), and of *Cassia angustifolia* (Indian Senna) (Fam. *Leguminoseæ*), contain *cathartic acid* which, under the influence of dil-
acids and heat, splits into *cathartogenic acid* and glucose; th
present *phæoretin*, *sennacrol*, *cathartomannit*, *crysoph*
etc. Cathartic acid is believed to be the chief pur

although several of the others possess cathartic properties. Average dose, 4 Gm. (60 gr.).

Official Preparations.—Fluidextractum Sennæ, Infusum Sennæ Compositum, Syrupus Sennæ, Confectio Sennæ.

Rheum, U. S. *Rhubarb.*—The dried rhizome of *Rheum officinale*, *Rheum palmatum*, and the variety *tanguticum* (Fam. *Polygonaceæ*), or probably other species of *Rheum*, grown in China and Thibet, and deprived of most of the bark and carefully dried. Contains *chrysophanic acid*, *emodin*, *rhein*, *rhubarberon*, and the resins, *erythroretin*, *phæretin*, and *aporetin*. The astringent properties of rhubarb are due to *rheotannic acid*, $C_{26}H_{26}O_{14}$.

Official Preparations.—Extractum Rhei, Fluidextractum Rhei, Tinctura Rhei, Tinctura Rhei Aromatica, Syrupus Rhei, Syrupus Rhei Aromaticus, Mistura Rhei et Sodæ, Pulvis Rhei Compositus, Pilulæ Rhei Compositæ.

Chrysarobinum, U. S.—*Chrysarobin.* $C_{30}H_{26}O_7 = 494.46$.—A neutral principle extracted from Goa Powder, a substance found deposited in the wood of *Vouacapoua Araroba* (Fam. *Leguminosæ*). In its commercial, more or less impure, form it is commonly misnamed Chrysophanic Acid. A pale orange-yellow micro-crystalline powder, tasteless, odorless, and irritating to the mucous membrane. (*Unguentum.*)

Jalapa, U. S.—*Jalap.*—The dried tuberous root of *Exogonium Purga* (Fam. *Convolvulaceæ*), yielding, when assayed by the U. S. P. process, not less than 8 per cent. of total resin, but not more than 1.5 per cent. of resin soluble in ether. Jalap contains from 12 to 20 per cent. of resin, the greater part of which is *convolvulin*, $C_{62}H_{100}O_{32}$, a glucoside, insoluble in ether; there are also present gum, sugar, starch, etc. (*Pulv. Comp.; Resin.*)

Rhamnus Purshiana (*Cascara Sagrada*). Contains a neutral crystallizable principle, *purshianin*, or *cascarin*, also *rhamnetin*, *emodin*, and *chrysophanic acid*, resins, and tannic, mallic, and oxalic acids.

Official Preparations.—Extractum Rhamni Purshianæ, Fluidextractum Rhamni Purshianæ, Fluidextractum Rhamni Purshianæ Aromaticum.

Aloe, U. S.—[Aloe Barbadensis, Aloe Socotrina, Pharm. 1890.]—The inspissated juice of the leaves of *Aloe vera*, *Aloe Chinensis* and *Aloe Perryi* or other species of Aloe (Fam. *Liliaceæ*), contains *aloin*, *emodin*, a trace of volatile oil, and a substance which has been improperly called resin. In yellowish-brown or orange-brown to blackish-brown opaque masses; translucent in thin fragments; fracture uneven, dull and waxy, somewhat resinous, or smooth and glassy; somewhat conchoidal; occasionally exhibiting microscopic crystals of aloin; odor characteristic; taste nauseous, bitter. Average dose, 0.250 Gm. (4 gr.).

Official Preparations.—Extractum Aloes, Aloe Purificata.

Aloe Purificata, U. S.—*Purified Aloes.*—It occurs in irregular,
ieces, of a dull brown or reddish-brown color, and having the
lor of aloes. Prepared by melting aloes, adding alcohol
consistency, and straining off the impurities, sand, earth,

chips, etc., evaporating, and, when cool, breaking the brittle mass into pieces of a convenient size. Average dose, 0.250 Gm. (4 gr.).

Official Preparations.—Tinctura Aloes, Tinctura Aloes et Myrrhæ, Pilulæ Aloes, Pilulæ Aloes et Ferri, Pilulæ Aloes et Masticheſ, Pilulæ Aloes et Myrrhæ.

Aloinum, U. S.—*Aloin.*—A neutral principle obtained from aloes, varying more or less in chemical composition and physical properties according to the source from which it is obtained, chiefly prepared from Curaçoa Aloes. A micro-crystalline powder or minute acicular crystals, lemon-yellow to dark yellow in color, possessing a slight odor of aloes, an intensely bitter taste, slightly hygroscopic, the air-dried powder yielding 1 molecule of water of crystallization at 100° C. (212° F.). Average dose, 0.065 Gm. (1 gr.).

Colocynthis, U. S.—*Colocynth.*—The peeled dried fruit of *Citrullus Colocynthis* (Fam. *Cucurbitaceæ*) contains *colocynthin*, *colocynthitin*, gum, resin, etc. Average dose, 0.065 Gm. (1 gr.). Colocynthin is a very bitter glucoside, splitting, under the action of diluted acids, into colocynthein and grape sugar. (*Ext.; Ext. Comp.*)

Elaterinum, U. S.—*Elaterin.* $C_{20}H_{28}O_5$; 345.60.—A neutral principle obtained from elaterium, a substance deposited by the juice of the fruit of *Ecballium Elaterium* (Fam. *Cucurbitaceæ*). Minute, white hexagonal scales or prismatic crystals, permanent in the air; odorless; having a slightly acrid, bitter taste. Average dose, 0.005 Gm. ($\frac{1}{10}$ gr.). Prepared from elaterium, a sediment deposited by the juice of the fruit of the squirting cucumber, by exhausting with alcohol, evaporating to the consistency of a thin oil, and throwing the residue, while yet warm, into a weak boiling solution of potassa, by which the green resin is held in solution, and the elaterin crystallizes out when the liquor cools. Or it may be made by exhausting elaterium with chloroform, and precipitating the elaterin from the chloroform solution by ether.

Official Preparation.—Trituratio Elaterini.

Tamarindus (*Tamarind*). **Cassia Fistula** (*Purging Cassia*). (Yields about 25 per cent. of pulp, which contains pectin, sugar, albuminous principles, salts, etc.) **Ficus** (*Fig*). **Prunum** (*Prune*). (Contains sugar, malic acid, pectin, salts, etc.) **Cambogia** (*Gamboge*). (A gum-resin obtained from *Garcinia Hanburii* (Fam. *Guttiferæ*); contains about 75 per cent. of resin, called *gambogic acid*.) **Scammonium** (*Scammony*). (Contains from 80 to 90 per cent. of resin having cathartic properties, called *scammonin*, $C_{34}H_{56}O_{16}$; this is identical with the jalapin obtained from *Ipomœa orizabensis*.) (*Resin.*) **Podophyllum** (*May Apple*). (Contains *picropodophyllin*, *podophyllotoxin*, and *podophyllinic acid*.) (*Fldext.; Resin.*) **Leptandra** (*Culver's Root*). (Contains a crystalline principle, *leptandrin*, resin, tannin, saponin, gum, mannit, etc.) (*Fldext.*) **Frangula** (*Rhamnus Frangula*). (Contains *frangulin*, $C_{20}H_{20}O_{10}$, sometimes ca
xanthin, and emodin; both are glucosides.) (*Fldext.*)
(*Wahoo*). (Contains resins, a bitter principle called *euon*
acid, starch, asparagin, and pectin.) (*Ext.; Fldext.*)

Drugs Containing Astringent Principles, and their Preparations.

Galla, U. S.—*Nutgall.*—An excrescence on *Quercus Infectoria*, caused by the punctures and deposited ova of *Cynips tinctoria*. Nutgall contains about 50 per cent. of tannin, 2 per cent. of gallic acid, sugar, gum, resin, and starch. (*Tr.; Ung't.*)

Acidum Tannicum, U. S.—*Tannic Acid.* $HC_{14}H_9O_9$; 319.6.6. (*Gallotannic Acid, Digallic Acid.*)—A monobasic organic acid, $[C_{13}H_9O_7 . COOH]$, obtained from nutgall. A light yellowish, amorphous powder, gradually turning darker when exposed to air and light, usually cohering in form of glistening scales or spongy masses, odorless, or having a faint, characteristic odor; strongly astringent taste; acid reaction. Average dose, 0.500 Gm. (7½ gr.). Prepared by exposing nutgall, in fine powder, to a damp atmosphere for twenty-four hours, making into a paste with ether, setting the paste aside, covered closely, for six hours, then expressing it powerfully between tinned plates, so as to obtain the liquid portion. The resulting cake is again made into a paste with ether and water, and expressed as before, after which the liquids are mixed and evaporated spontaneously to a syrupy consistence, then spread on glass or tin plates, and dried quickly in a drying closet. Water and ether form a soluble compound with the tannic acid, and the expression separates it from the paste, after which the ether and water are driven off by the heat. (*Glycer.; Ung't.; Troch.*)

Acidum Gallicum, U. S.—*Gallic Acid.* $HC_7H_5O_5 . H_2O$; 186.65. —An organic acid, $[C_6H_2(OH)_3 . COOH + H_2O]$, usually prepared from tannic acid. White, or pale fawn-colored, silky, interlaced needles or triclinic prisms, permanent in the air; odorless; astringent and slightly acidulous taste. Prepared by macerating nutgalls (powdered and made into a paste) with water, for a month, expressing, rejecting the expressed liquor, boiling the residue in water, filtering, while hot, through animal charcoal, and crystallizing. Average dose, 1 Gm. (15 gr.).

Pyrogallol, U. S.—*Pyrogallol.* $C_6H_6O_3 = 125.10$. (*Pyrogallic Acid.*)—A triatomic phenol, $[C_6H_3(OH)_3\ 1:2:3]$, obtained chiefly by carefully heating gallic acid. Light, white laminæ or fine needles, odorless, and having a bitter taste, acquiring a grayish tint on exposure to air and light.

When gallic acid is sublimed, the heat converts it into pyrogallic acid and carbon dioxide:—

$$\begin{array}{ccccc} C_7H_6O_5 & = & C_6H_6O_3 & + & CO_2. \\ \text{Gallic Acid.} & & \text{Pyrogallic Acid.} & & \text{Carbon Dioxide.} \end{array}$$

Gambir, U. S.—*Gambir.* [To replace Catechu, Pharm. 1890.] (Pale Catechu.) An extract prepared from the leaves and twigs of *Ourouparia Gambir* (Fam. *Rubiaceæ*). Irregular masses, or cubes of about 25 Mm. in diameter; externally reddish-brown, pale brownish-gray, or light brown; fracture dull-earthy, friable, crystalline; inodorous, bitterish, very astringent, with a sweetish after-taste; free from starch. Average dose, 1 Gm. (15 gr.). (*Tr. Comp.; Troch.*)

Kino. (Contains kino-tannic acid, pyrocatechin, kino-red, kinoin, gum, etc. Owing to the decomposition of the kinotannic acid, the liquid preparations frequently gelatinize.) (*Tr.*) **Hæmatoxylon** (*Logwood*). (Contains a colorless sweet principle, *hæmatoxylin*, $C_{16}H_{14}O_6$, which is reddened upon exposure to light, and turns blackish-purple upon contact with alkalies, yielding *hæmatëin*, $C_{16}H_{12}O_6 . H_2O$. It also contains tannin, resin, etc.) (*Ext.*) **Krameria** (*Rhatany*). (Contains about 18 per cent. of kramerotannic acid, starch, gum, rhatannic red, etc.) (*Ext.; Fldext.; Tr.*) **Quercus** (*White Oak*). (Contains about 10 per cent. of tannic acid, with pectin, resin, and brownish-red coloring matter.) (*Fldext.*) **Rosa Gallica** (*Red Rose*). (Contains *quercitrin* and *quercitannic acid;* the pale red coloring matter is made bright red by the addition of sulphuric acid.) (*Fldext.; Mel.; Confec.; Syr.*) **Oleum Rosæ.** (*Ungt.*) **Rhus Glabra** (*Sumach*). **Rubus** (*Blackberry*). (Owes its astringent properties to tannic acid.) (*Fldext. Syr.*) **Geranium** (*Cranesbill*). (Contains about 15 per cent. of tannic acid, with brownish-red coloring matter, starch, sugar, pectin, etc.) (*Fldext.*) **Hamamelis Cortex** (*Witchhazel Bark*). (Contains tannic acid, chlorophyl, bitter principle, mucilage, etc.) (*Fldext.*) **Hamamelidis Folia** (*Witchhazel Leaves*). (*Aqua.*) **Chimaphila** (*Pipsissewa*). (Contains about 5 per cent. of tannic acid, with *chimaphilin*, *ericolin*, *arbutin*, *urson*, sugar, gum, etc.) (*Fldext.*) **Uva Ursi** (*Bearberry*). (Contains about 6 per cent. of tannic acid, with gallic acid, *urson*, *arbutin*, *ericolin*, gum, resin, coloring matter, etc.) (*Fldext.*) **Salvia** (*Sage*).

ALKALOIDS.

Chemically, many of the vegetable alkaloids are closely related to pyridine, and some of them may be synthesized, starting from a pyridine base. They have many properties which show their similarity to ammonia. They are mostly composed of C, H, N, and O; in some O is wanting.

Source of Alkaloids: They are found in both the animal and vegetable kingdoms.

Distinctive Features: First, they all contain N. The non-volatile alkaloids are mostly solid; the volatile alkaloids are chiefly liquid. Second, they restore the color of reddened litmus, combine with acids to form salts, and are precipitated from their saline solutions by alkalies. Third, they are generally the active principles of the plants in which they reside, are mostly poisonous, and have a bitter, acrid, or pungent taste. Fourth, they are mostly crystallizable and colorless, insoluble in H_2O, soluble in alcohol, chloroform, benzin, benzol, and some in ether. Their salts, however, are mostly soluble in H_2O, less so in alcohol; insoluble in chloroform, ether, benzin, and benzol. Fifth, they are mostly precipitated by one or more of the following reagents: *Potassio-mercuric iodide*, *gold chloride*, *tannic acid*, *phospho-molybdic acid*, a

Nomenclature adopted for the Alkaloids: The last

terminate in *ine;* the Latin termination is *ina;* the

principles and glucosides end in *in.*

Opium, U. S.—*Opium.*—The concrete, milky exudation obtained by incising unripe capsules of *Papaver somniferum* (Fam. *Papaveraceæ*), and yielding, in its normal moist condition, not less than 9 per cent. of morphine when assayed by the U. S. P. process. (*Opii Pulvis; Opium Gran.*)

Two Acids found in Opium combined with the Alkaloids: Meconic and lactic acids.

Number of Alkaloids Opium contains: Nineteen, of which the most important is morphine.

Opii Pulvis, U. S.—*Powdered Opium.*—Opium dried at a temperature not exceeding 85° C. (185° F.), and reduced to a very fine (No. 80) powder. Should yield not less than 12 nor more than 12.5 per cent. of crystallized morphine. Average dose, 0.065 Gm. = 65 Mg. (1 gr.).

Official Preparations.—Opium Deodoratum, Acetum Opii, Extractum Opii, Tinctura Opii Camphorata, Pilulæ Opii, Pulvis Ipecacuanhæ et Opii, Trochisci Glycyrrhizæ et Opii.

Opium Deodoratum, U. S.—*Deodorized Opium.* Opium from which the narcotine has been extracted with Purified Petroleum Benzin. Should yield not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine. Average dose, 0.065 Gm. = 65 Mg. (1 gr.).

Official Preparation of Extract of Opium.—Emplastrum Opii.

Opium Granulatum, U. S.—*Granulated Opium.*—Opium dried at a temperature not exceeding 85° C. (185° F.) and reduced to a coarse (No. 20) powder. Should yield not less than 12 per cent. nor more than 12.5 per cent. of crystallized morphine when assayed by the U. S. P. process. Average dose, 0.065 Gm. = 65 Mg. (1 gr.).

Official Preparations.—Tinctura Opii, Tinctura Opii Deodorata, Vinum Opii.

Morphina, U. S.—*Morphine.* $C_{17}H_{19}NO_3 + H_2O$; 300.92.—An alkaloid obtained from Opium. Colorless or white, shining, rhombic prisms, or fine needles, or a crystalline powder, permanent in the air; odorless; bitter taste. Prepared from an aqueous solution of opium containing the alkaloid in combination with meconic and lactic acids, by treating it with alcohol and water of ammonia—the former retaining the coloring matter, caoutchouc, resins, etc., in solution, while the latter sets free the morphine, by combining with the natural acids. The alkaloid is then purified by dissolving in boiling alcohol, filtering through animal charcoal, and crystallizing. Average dose, 0.10 Gm. = 10 Mg. ($\frac{1}{5}$ gr.).

Morphinæ Acetas, U. S.—*Morphine Acetate.* $C_{17}H_{19}NO_3C_2H_4O_2 + 3H_2O$; 396.26.—The acetate, $[CH_3COOH . C_{17}H_{19}NO_3 + 3H_2O]$, of the alkaloid morphine. A white or yellowish-white crystallline or amorphous powder, having a faintly acetous odor, a bitter taste, and a neutral or faintly alkaline rea[illegible]ion. Prepared by acting on morphine [illegible]15 Gm. ($\frac{1}{4}$ gr.).

[illegible] S.—*Morphine Hydrochloride.* [illegible]orphinæ Hydrochloras, Pharm. [illegible]icro-crystalline cubes, or a white crystalline powder; permanent in the air; odorless; bitter taste. Made by acting on morphine with hydrochloric acid. The hydrochloride, [$HCl.C_{17}H_{19}NO_3 + 3H_2O$], of the alkaloid morphine. Average dose, 0.015 Gm. ($\frac{1}{4}$ gr.).

Morphinæ Sulphas, U. S.—*Morphine Sulphate.* $(C_{17}H_{19}NO_3)_2.H_2SO_4 + 5H_2O$; 752.83.—The sulphate, [$SO_2(OH)_2(C_{17}H_{19}NO_3)_2 + 5H_2O$], of the alkaloid morphine. White, feathery, acicular, silky crystals; odorless; bitter taste; permanent in the air. Prepared by acting on morphine with sulphuric acid. Average dose, 0.015 Gm. ($\frac{1}{4}$ gr.).

Official Preparation.—Pulvis Morphinæ Compositus.

Codeina, U. S.—*Codeine.* $C_{18}H_{21}NO_3 + H_2O$; 314.83.—An alkaloid, [$C_{17}H_{18}(CH_3)NO_3 + H_2O$], obtained from opium or prepared from morphine by methylation. White or nearly translucent, orthorhombic prisms, octahedral crystals, or a crystalline powder; slightly efflorescent in warm air; odorless; slightly bitter taste. Prepared by precipitating the hydrochlorates of morphine and codeine with ammonia, codeine remaining in solution, and afterward obtained by evaporation, crystallization, and purifying by dissolving in hot ether and evaporating spontaneously. Average dose, 0.030 Gm. ($\frac{1}{2}$ gr.).

Codeina Phosphas, U. S.—*Codeine Phosphate.*—$C_{18}H_{21}NO_3.H_3PO_4 + 2H_2O = 430.0$. The phosphate, [$PO(OH)_3(C_{17}H_{18}(CH_3)NO_3) + 2H_2O$], of an alkaloid obtained from Opium, or prepared from Morphine by methylation. Firm, white, needle-shaped crystals or a crystalline powder, without odor, and having a bitter taste. Average dose, 0.030 Gm. ($\frac{1}{2}$ gr.).

Codeinæ Sulphas, U. S.—*Codeine Sulphate.* $(C_{18}H_{21}NO_3)_2.H_2SO_4 + 5H_2O = 780.65$. The sulphate [$SO_2(OH)_2.(C_{17}H_{18}(CH_3)NO_3)_2 + 5H_2O$] of an alkaloid obtained from Opium, or prepared from morphine by methylation. Long, glistening, white, needle-shaped crystals, rhombic prisms, or a crystalline powder, efflorescing in the air, odorless, and having a bitter taste. Average dose, 0.030 Gm. ($\frac{1}{2}$ gr.).

Apomorphinæ Hydrochloridum, U. S.—*Apomorphine Hydrochlorate.* $C_{17}H_{17}NO_2.HCl = 301.34$. [Apomorphinæ Hydrochloras, Pharm. 1890.]—The hydrochloride of an artificial alkaloid prepared from morphine by the abstraction of one molecule of water. Minute grayish-white, monoclinic prisms, glistening, odorless, having a slightly bitter taste, and acquiring a greenish tint upon exposure to light and air. Average dose, Expectorant, 0.002 Gm. ($\frac{1}{30}$ gr.); Emetic, 0.005 Gm. ($\frac{1}{10}$ gr.). Prepared by heating morphine in a closed tube, with a great excess of hydrochloric acid, for two or three hours, to the temperature of 140° to 150° C. (284°–302° F.), dissolving the contents of the tube in water, adding an excess of $NaHCO_3$, and exhausting the precipitate with ether or chloroform; the addition of HCl now results in crystals of the salt. The rationale of the process is one of dehydration; the morphine parts with one molecule of water.

Cinchona, U. S.—*Cinchona.* (*Peruvian Bark.*)—The dried bark of *Cinchona Ledgeriana, Cinchona Calisaya, Cinchona officinalis* (Fam.

Rubiaceæ) and of hybrids of these and of other species of cinchona, yielding, when assayed by the U. S. P. process, not less than 5 per cent. of total anhydrous cinchona alkaloids, and at least 4 per cent. of anhydrous ether-soluble alkaloids when assayed by the U. S. P. process. Average dose, 1 Gm. (15 gr.).

Cinchona Rubra, U. S.—*Red Cinchona.* (*Peruvian Bark.*)—The dried bark of the trunk of *Cinchona succirubra* (Fam. *Rubiaceæ*), or of its hybrids, yielding not less than 5 per cent. of anhydrous cinchona alkaloids when assayed by the U. S. P. process. Average dose, 1 Gm. (15 gr.).

About twenty alkaloids have been discovered in cinchona bark. Some of these are found only in one kind of bark; some are, doubtless, "split products" (alkaloids not existing naturally in the bark, but the result of the action of chemical agents upon it). The most important alkaloids found in cinchona are *quinine*, *quinidine*, *cinchonine*, and *cinchonidine*. The acids present are *kinic* or *quinic*, *cinchotannic*, and *kinovic* or *quinovic*. The neutral principle is *kinovin* or *quinovin; cinchonic red*, volatile oil, and red and yellow coloring matters are also present.

Official Preparations.—Fluidextractum Cinchonæ, Tinctura Cinchonæ, Tinctura Cinchonæ Compositæ.

Quinina, U. S.—*Quinine.* $C_{20}H_{24}N_2O_2 + 3H_2O$; 375.46.—An alkaloid obtained from the bark of various species of cinchona. Quinine occurs in the form of a white, flaky, or micro-crystalline powder; odorless, having a bitter taste and slightly efflorescent in dry air. Prepared by adding to the acid solution of the sulphate, ammonia water or solution of soda, which precipitates the alkaloid. As quinine is soluble in alkalies, carefully avoid excess. Average dose, 0.250 Gm. (4 gr.).

Quininæ Sulphas, U. S.—*Quinine Sulphate.* $(C_{20}H_{24}N_2O_2)_2H_2SO_4 . 7H_2O$; 866.15.—The sulphate, $[SO_2(OH)_2 . C_{20}H_{24}N_2O_2 + 7H_2O]$, of the alkaloid quinine. White, silky, light, flexible, glistening crystals, or hard, prismatic, monoclinic needles, making a very light and easily compressible mass, odorless, and having a persistent, very bitter taste. It effloresces rapidly when it is exposed to dry air, and then becomes lustreless; when exposed to light, it acquires a brownish tint. Average dose, 0.250 Gm. (4 gr.). Prepared by treating yellow cinchona bark with hydrochloric acid, which forms with the alkaloids soluble hydrochlorates; decomposing with lime, which precipitates the alkaloid; dissolving out the alkaloid from the excess of lime with boiling alcohol; evaporating; acidulating with sulphuric acid, which forms the sulphate, then purifying with animal charcoal, and crystallizing.

Quininæ Bisulphas, U. S.—*Quinine Bisulphate.* $C_{20}H_{24}N_2O_2 . H_2SO_4 + 7H_2O$; 544.33.—The acid sulphate, $[SO_2(OH)_2 . C_{20}H_{24}N_2O_2 + 7H_2O]$, of the alkaloid quinine. Colorless, transparent or whitish orthorhombic crystals or small needles, odorless; very bitter taste. I effloresces on exposure to the air, and turns yellow on exposure to th light. Average dose, 0.250 Gm. (4 gr.). Prepared by acting on quinin sulphate by sulphuric acid. The bisulphate of quinine contains per cent. less alkaloid than the sulphate.

Quininæ Hydrochloridum, U. S.—*Quinine Hydrochloride.* $C_{20}H_{24}N_2O_2 . HCl + 2H_2O$; 393.76. [Quininæ Hydrochloras, Pharm. 1890.] The hydrochloride, [$HCl . C_{20}H_{24}N_2O_2 + 2H_2O$], of the alkaloid quinine. White, silky, glistening needles; odorless, and having a very bitter taste. The salt effloresces when exposed to warm air. Average dose, 0.250 Gm. (4 gr.). Prepared by double decomposition between quinine sulphate and barium chloride, or by dissolving the alkaloid in dilute HCl, evaporating, and crystallizing.

Quininæ Hydrobromidum, U. S.—*Quinine Hydrobromide.* $C_{20}H_{24}N_2O_2 . HBr + 2H_2O$; 420.06. [Quininæ Hydrobromas, Pharm. 1890.]—The hydrobromide, [$HBr. C_{20}H_{24}N_2O_2 + H_2O$], of the alkaloid quinine. White, light, silky needles; odorless, and having a very bitter taste. The salt effloresces on exposure to the air. Prepared by decomposing quinine sulphate in alcohol, with potassium bromide, in water. K_2SO_4 crystallizes out, and the hydrobromate may be obtained by evaporating and crystallizing. Quinine hydrobromate may also be made by double decomposition between quinine sulphate and barium bromide, or by dissolving the alkaloids in hot dilute hydrobromic acid. Average dose, 0.250 Gm. (4 gr.).

Quininæ Salicylas, U. S.—*Quinine Salicylate,* $2C_{20}H_{24}N_2O_2 . C_7H_6O_3 + H_2O = 935.54$.—The salicylate [$2C_6H_4(OH)COOH . C_{20}H_{24}N_2O_2 + H_2O$] of the alkaloid quinine. Colorless needles, permanent in the air, but on keeping readily assuming a pinkish color. Average dose, 0.050 Gm. (4 gr.). Prepared by double decomposition between solutions of quinine hydrochloride, and ammonium salicylate.

Cinchoninæ Sulphas, U. S.—*Cinchonine Sulphate.* $(C_{19}H_{22}N_2O)_2 . H_2SO_4 + 2H_2O$; 717.17. The neutral sulphate [$SO_2(OH)_2 . C_{19}H_{22}N_2O)_2 + 2H_2O$] of an alkaloid obtained from the bark of several species of cinchona. White, hard, lustrous, prismatic crystals; odorless; permanent in the air; very bitter taste. Average dose, 0.250 Gm. (4 gr.).

Cinchonidinæ Sulphas, U. S.—*Cinchonidine Sulphate.* $(C_{19}H_{22}N_2O)_2 . H_2SO_4 + 3H_2O$; 735.05.—The neutral sulphate, [$SO_2(OH)_2 . (C_{19}H_{22}N_2O)_2 + 3H_2O$], of an alkaloid of cinchona, obtained from the bark of several species of cinchona. Odorless; very bitter taste. White, glistening, silky needles or prisms, permanent in the air. Average dose, 0.250 Gm. (4 gr.).

Nux Vomica, U. S.—*Nux Vomica.*—The dried, ripe seed of *Strychnos Nux-vomica* (Fam. *Loganaceæ*), yielding, when assayed by the U. S. P. process, not less than 1.25 per cent. of strychnine. It contains strychnine, brucine ($C_{23}H_{26}N_2O_4$), probably loganin, igasuric acid, protein compounds, gum, fixed oil, sugar, etc. It owes its activity principally to strychnine.

Official Preparations.—Extractum Nucis Vomicæ, Fluidextractum Nucis Vomicæ, Tinctura Nucis Vomicæ.

Strychnina, U. S.—*Strychnine.* $C_{21}H_{22}N_2O_2 = 331.73$.—An alkaloid obtained from Nux Vomica, and also obtainable from other plant of the *Loganiaceæ*. Colorless, transparent, prismatic crystals, white, crystalline powder; odorless; intensely bitter taste, whi still perceptible in a highly dilute (1 in 700,000) solution; alkaline reaction; permanent in the air. Should be tasted with extreme caution. Prepared by treating nux vomica with hydrochloric acid, decomposing with lime, dissolving out from the excess of lime with boiling alcohol (the brucine having been previously removed by treatment with diluted alcohol), evaporating the alcoholic solution, acidulating with H_2SO_4, to form a sulphate, decolorizing and crystallizing, then dissolving the crystals and precipitating the alkaloid by ammonia water. Average dose, 0.001 Gm. ($\frac{1}{64}$ gr.).

Strychninæ Nitras, U. S.—*Strychnine Nitrate.* $C_{21}H_{22}N_2O_2HNO_3 =$ 394.30.—The nitrate [$NO_2OH . C_{21}H_{22}N_2O_2$] of the alkaloid Strychnine. Colorless, glistening needles; odorless, and having an intensely bitter taste. Should be tasted with extreme caution. Permanent in the air. Prepared by dissolving strychnine in warm diluted HNO_3, evaporating and crystallizing. Average dose, 0.001 Gm. ($\frac{1}{64}$ gr.).

Gelsemium. (*Yellow Jasmine.*) (Contains *gelsemine*, $C_{11}H_{12}NO_2$, gelseminic acid, volatile oil, starch, resin, fat, coloring matter, etc.) (*Fldext.; Tr.*)

Physostigma. (*Calabar Bean.*) (Contains *physostigmine* or eserine, $C_{15}H_{21}N_3O_2$, an alkaloid; amorphous and without taste; also *calabarine*, an alkaloid derived from eserine; and a neutral principle, *physosterin;* also starch, protein compounds, mucilage, etc.) (*Ext.; Tr.*)

Physostigminæ Salicylas. $C_{15}H_{21}N_3O_2 . C_7H_6O_3 = 410.21$. (*Eserine Salicylate.*)—The salicylate [$C_6H_4(OH)COOH . C_{15}H_{21}N_3O_2$] of an alkaloid obtained from physostigma. Prepared by adding 2 per cent. of physostigmine to a solution of 1 per cent. of salicylic acid in 35 per cent. boiling distilled water, and allowing the salt to crystallize on cooling. Average dose, 0.001 Gm. ($\frac{1}{64}$ gr.).

Physostigminæ Sulphas, U. S.—*Physostigmine Sulphate.* $(C_{15}H_{21}N_3O_2)_2 . H_2SO_4$; 643.75. (*Eserine Sulphate.*)—The sulphate [$SO_2(OH)_2 .-(C_{15}H_{21}N_3O_2)_2$] of an alkaloid obtained from physostigma. Average dose, 0.001 Gm. ($\frac{1}{64}$ gr.).

Belladonnæ Folia.—Should yield, when assayed by the U. S. P. process, not less than 0.35 per cent. of mydriatic alkaloids. Average dose, 0.065 Gm. (1 gr.). (*Ext.; Emplas.; Tr.; Ungt.*)

Belladonnæ Radix.—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of mydriatic alkaloids. Average dose, 0.45 Gm. ($\frac{3}{4}$ gr.). Belladonna owes its activity to *atropine*, $C_{17}H_{23}NO_3$, and a small quantity of *hyoscyamine;* it also contains *belladonnine.* (*Fldext.; Lin.*)

Atropina, U. S.—*Atropine.* $C_{17}H_{23}NO_3$; 287.04.—An alkaloid obtained from *Atropa Belladonna* (Fam. *Solanaceæ*), and from other plants of the same family. As it occurs in commerce, it is always accompanied by a small proportion of hyoscyamine, from which it cannot be readily separated. White rhombic prisms, elongated in the direction of the major axis, as they contain more or less hyoscyamine. Odorless; bitter and acrid taste (it should be tasted with the utmost caution and only in dilute solution), alkaline reaction with litmus, phenolphthalein, and hematoxylin T. S. Average dose, 0.0004 Gm. ($\frac{1}{160}$ gr.). Prepared by treating a concentrated alcoholic tincture of the root with H_2SO_4, to convert the atropine into sulphate, distilling off the alcohol, adding water to the residuary liquid, filtering, to separate oil and resin, treating the filtrate with potassium hydrate and chloroform—the former to decompose the sulphate, and evaporating the latter to obtain the alkaloid.

Official Preparation.—Oleatum Atropinæ.

Atropinæ Sulphas, U. S.—*Atropine Sulphate.* $(C_{17}H_{23}NO_3)_2 . H_2SO_4 = 671.43$.—The sulphate $[SO_2(OH)_2 . (C_{17}H_{23}NO_3)_2]$ of an alkaloid obtained from *Atropa Belladonna* (Fam. *Solanaceæ*), and from other plants of the same family. As it occurs in commerce, it usually contains a small amount of hyoscyamine sulphate, from which it cannot be readily separated. A white crystalline powder or microscopical needles and prisms (the form of the latter being probably due to the hyoscyamine present); odorless, bitter, nauseating taste, permanent in the air. It should be tasted with the utmost caution, and only in dilute solution. Average dose, 0.0004 Gm. ($\frac{1}{160}$ gr.). Prepared by treating the alkaloid with dilute sulphuric acid, and evaporating at a temperature not exceeding 37.7° C. (100° F.).

Homatropinæ Hydrobromidum, U. S.—*Homatropine Hydrobromide.* $C_{16}H_{21}NO_3 . HBr = 253.49$. The hydrobromide $[HBr . C_{16}H_{21}NO_3]$ of an alkaloid obtained by the condensation of atropine and mandelic acid. A white, odorless, crystalline powder, or rhombic prisms, having a bitter taste. Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Scopola.—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of its alkaloids. Average dose, 0.65 Gm. ($\frac{3}{4}$ gr.). (*Ext.; Fldext.*)

Scopolaminæ Hydrobromidum, U. S.—*Scopolamine Hydrobromide.* $C_{17}H_{21}NO_4 . HBr. + 3H_2O = 434.92$.— The hydrobromide $[HBr . C_{17}H_{21}NO_4 + 3H_2O]$ of an alkaloid obtained from plants of the *Solanaceæ*, chemically identical with hyoscine hydrobromide (see Hyoscinæ Hydrobromidum). Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Hyoscyamus. (*Henbane.*)—Should yield, when assayed by the U. S. P. process, not less than 0.08 per cent. of mydriatic alkaloid. Hyoscyamus contains hyoscyamine, $C_{17}H_{23}NO_3$; hyoscine, $C_{17}H_{23}NO_3$; hyoscypicrin, $C_{27}H_{52}O_{14}$; chlorophyl, mucilage, extractive matter, etc. Average dose, 0.250 Gm. (4 gr.). (*Ext.; Fldext.*)

Hyoscinæ Hydrobromidum, U. S.—*Hyoscine Hydrobromide.* $C_{17}H_{21}NO_4HBr + 3H_2O = 434.92$. [Hyoscinæ Hydrobromas, Pharm. 1890.]—The hydrobromide $[HBr . C_{17}H_{21}NO_4 + 3H_2O]$ of an alkaloid chemically identical with scopolamine, obtained from hyoscyamus and other plants of the *Solanaceæ*. Colorless, transparent, rhombic crystals, sometimes of large size; odorless, and having an acrid, slightly bitter taste; slightly efflorescent. Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Hyoscyaminæ Hydrobromidum, U. S.—*Hyoscyamine Hydrobromide.* [Hyoscyaminæ Hydrobromas, Pharm. 1890.] $C_{17}H_{23}NO_3 . HBr = 367.40$.—The hydrobromide $[HBr . C_{17}H_{23}NO_3]$ of an alkaloid obtained from hyoscyamus and other plants of the *Solanaceæ*. White, prismatic crystals, or a yellowish, amorphous, resin-like mass, having, particularly when damp, a tobacco-like odor, and an acrid, nauseous, and bitter taste; deliquescent on exposure to the air. Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Hyoscyaminæ Sulphas, U. S.—*Hyoscyamine Sulphate.* $(C_{17}H_{23}NO_3)_2H_2SO_4 = 671.43$.—The neutral sulphate $[SO_2(OH)_2 . (C_{17}H_{23}NO_3)_2]$ of an alkaloid obtained from hyoscyamus and other plants of the *Solanaceæ;* white, indistinct crystals, or a white powder, deliquescent on exposure to the air; odorless, having a bitter and acrid taste and a neutral reaction. Prepared by heating an acidulated tincture of the seeds, after separating the fixed oil, with soda, precipitating with tannin, mixing the precipitate with lime, exhausting with alcohol, acidulating, concentrating, agitating with ether, to remove coloring matter and oil, afterward decolorizing and recrystallizing. Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Stramonium.—Should yield, when assayed by the U. S. P. process, not less than 0.35 per cent. of mydriatic alkaloids. Average dose, 0.065 Gm. (1 gr.). (*Ext.; Fldext.; Tr.; Ungt.*)

Pilocarpus. (*Jaborandi.*)—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of alkaloids. Pilocarpus contains *pilocarpine*, $C_{11}H_{16}N_2O_2$, *jaborine*, $C_{11}H_{26}N_2O_{21}$, and volatile oil, consisting principally of *dipentine*, $C_{10}H_{16}$, a terpene. (*Fldext.*)

Pilocarpinæ Hydrochloridum, U. S.—*Pilocarpine Hydrochloride.* $C_{11}H_{16}N_2O_2 . HCl$; 248.81. [Pilocarpinæ Hydrochloras, Pharm. 1890.] The hydrochloride $[HCl . C_{11}H_{16}N_2O_2]$ of an alkaloid obtained from Pilocarpus. Colorless, or white, transparent crystals, odorless, and having a faintly bitter taste; deliquescent on exposure to the air. Average dose, 0.010 Gm. ($\frac{1}{5}$ gr.). Prepared by treating pilocarpine with dilute HCl, concentrating, and crystallizing.

Pilocarpinæ Nitras, U. S.—*Pilocarpine Nitrite.* $C_{11}H_{16}N_2O_2 . HNO_3 = 269.20$. The nitrate $[NO_2OH . C_{11}H_{16}N_2O_2]$ of an alkaloid obtained from pilocarpus. Colorless, or white shining crystals; odorless, and having a faintly bitter taste; permanent in the air. Prepared by adding pilocarpine to dilute HNO_3, evaporating and crystallizing. Average dose, 0.010 Gm. ($\frac{1}{5}$ gr.).

Colchici Cormus.—Should yield, when assayed by the U. S. P. process, not less than 0.35 per cent. of colchicin. Average dose, 0.250 Gm. (4 gr.).

Colchici Semen, U. S.—*Colchicum Seed.* The seed of *Colchicum autumnale*, yielding, when assayed by the U. S. P. process, not less than 0.55 per cent. of colchicine. Average dose, 0.200 Gm. (3 gr.). Colchicum contains the alkaloid *colchicine*, both in corm and seed. In the former there are present starch, gum, fat, sugar, resin, etc. In the latter a fixed oil is found in addition to the other principles. The alkaloid may be extracted by digesting the seeds in hot alcohol without powdering them. (*Ext.; Fldext.; Tr.; Vin.*)

Colchicina, U. S.—*Colchicine.* $C_{22}H_{25}NO_6 = 396.23$.—An alkaloid obtained from colchicum. Pale yellow leaflets, or a pale yellow, amorphous powder, turning darker on exposure to light, having an odor suggesting damp hay, and a very bitter taste. Average dose, 0.0005 Gm. ($\frac{1}{128}$ gr.).

Veratrum. (*American hellebore.*)—(From *Veratrum viride*, or *Veratrum Album.*) Contains the alkaloids *jervine*, *pseudojervine*, and *rubijervine*, *protoveratrine*, and *protoveratridine*, *jervic acid*, also resins, starch, coloring matter, etc. Average dose, 0.125 Gm. (2 gr.). (*Fldext.; Tr.*)

Veratrina, U. S.—*Veratine.*—A mixture of alkaloids obtained from the seeds of *Asagræa officinalis* (Fam. *Liliaceæ*), occurring in the form of a white or grayish-white, amorphous powder; odorless and causing intense irritation and sneezing when even a minute quantity reaches the nasal mucous membrane; of acrid taste, leaving a sensation of tingling and numbness on the tongue. It should be tasted with great caution. Slightly hygroscopic in moist air. Average dose, 0.002 Gm. ($\frac{1}{30}$ gr.). Prepared by exhausting the seeds with alcohol, recovering the alcohol by distillation, diluting the residuary liquid, which contains veratrine in its neutral combination with veratric acid, with water, to precipitate the resin, filtering, adding potassa or ammonia to precipitate the alkaloid, redissolving, decolorizing, and reprecipitating.

Official Preparations.—Oleatum Veratrinæ, Unguentum Veratrinæ.

Sanguinaria. (*Bloodroot.*)—Contains *sanguinarine*, $C_{19}H_{17}NO_4$; a colorless alkaloid which yields bright red salts; another unnamed alkaloid; also malic and citric acid, starch, resins, coloring matter, etc. (*Fldext.; Tr.*)

Staphisagria. (*Stavesacre.*)—Contains three alkaloids, *delphinine*, *delphisine*, and *delphinoidine*, also *staphisain*, with fixed oil, protein compounds, etc. (*Fldext.*)

Aconitum, U. S. (*Aconite.*)—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of aconitine. Aconite contains *aconitine*, $C_{34}H_{47}NO_{11}$, and *picraconitine*, $C_{32}H_{45}NO_{10}$. *Aconitic acid*, $H_6C_6O_6$, is present, together with resin, sugar, fat, coloring matter, etc. Average dose, 0.065 Gm. (1 gr.).

Aconitina, U. S.—*Aconitine.*—$C_{34}H_{47}NO_{11} = 640.55$.—An alkaloid obtained from aconite. It should be kept in amber-colored, well-stoppered vials. Colorless or white rhombic tables or prisms, possessing no odor, permanent in the air, and producing, in extremely diluted solutions, a characteristic tingling sensation when brought in contact with the mucous surfaces of the tongue or lips. *The alkaloid itself should never be tasted, and its solutions only when largely diluted, and then with the utmost caution.* Average dose, 0.00015 Gm. ($\frac{1}{400}$ gr.).

Official Preparations.—Fluidextractum Aconiti, Tinctura Aconiti.

Hydrastis, U. S.—*Hydrastis.* (*Golden Seal.*)—Should yield, when assayed by the U. S. P., not less than 2.5 per cent. of hydrastine. Hydrastis contains *hydrastine*, $C_{21}H_{21}NO_6$; *berberine*, $C_{20}H_{17}NO_4$; *canadine*, $C_{20}H_{21}NO_4$, sugar, starch, resin, coloring matter, etc. Average dose, 2 Gm. (30 gr.).

Official Preparations.—Fluidextractum Hydrastis, Tinctura Hydrastis, Glyceritum Hydrastis.

Hydrastina, U. S.—*Hydrastine.*—$C_{20}H_{21}NO_6$ = 380.32.—An alkaloid obtained from hydrastis. White to creamy white, glistening prisms, sometimes of a large size, possessing a bitter taste, and permanent in the air. Prepared by adding HCl or H_2SO_4 to an alcoholic tincture, the berberine precipitating (crystalline); ammonia is then added to the filtered mother liquors, and the precipitated hydrastine is purified by recrystallization. Average dose, 0.010 Gm. (⅕ gr.).

Hydrastininæ Hydrochloridum, U. S.—*Hydrastinine Hydrochloride.*—$C_{11}H_{11}NO_2HCl$ = 223.88. [Hydrastininæ Hydrochloras, Pharm. 1890.]—The hydrochloride [$HCl . C_{11}H_{11}NO_2$] of an artificial alkaloid derived from hydrastine. Light-yellow needles, or a yellowish-white crystalline powder; odorless, and having a bitter taste. Average dose, 0.030 Gm. (½ gr.).

Berberis. (*Berberis aquifolium*, and other species of Berberis.)—Contains *berberine*, $C_{20}H_{17}NO_4$, and *oxyacanthine*. (*Fldext*)

Granatum. (*Pomegranate.*)—Contains four alkaloids: *pelletierine* (*punicine*), *isopelletierine*, *methylpelletierine*, *pseudopelletierine*. The first three are liquid, the latter solid and crystalline. The drug also contains punico-tannic acid, $C_{20}H_{16}O_{13}$, sugar, mannit, pectin, gum, etc. Average dose, 2 Gm. (30 gr.). (*Fldext.*)

Pelletierinæ Tannas, U. S.—*Pelletierine Tannate.*—A mixture in varying proportions of the tannates of four alkaloids (punicine, isopunicine, methyl-punicine, and pseudopunicine) obtained from *Punica Granatum*. A light yellow, odorless, amorphous powder, having an astringent taste, and a weak acid reaction. Average dose, 0.250 Gm. (4 gr.).

Pareira. (*Pareira Brava.*)—Contains *pelosine*, or *cissampeline*, which is identical with buxine and berberine, alkaloids obtained from *Buxus sempervirens* and *Nectandra Rodiæi*. Average dose, 2 Gm. (30 gr.).

Ipecacuanha, U. S.—*Ipecac.*—The dried root, to which may be attached a portion of the stem not exceeding 7 Cm. in length of *Cephaëlis Ipecacuanha* (Fam. *Rubiaceæ*), known commercially as *Rio*, *Brazilian*, or *Para* ipecac, or the corresponding portion of *C. acuminata*, known commercially as *Carthagena ipecac*, yielding, when assayed by the U. S. P. process, not less than 2 per cent. of ipecac alkaloids. Ipecac contains emetine, $C_{30}H_{40}N_2O_5$, *cephaëline*, $C_{28}H_{40}N_2O_4$, and psychotrine, ipecacuanhic acid, pectin, starch, resin, sugar, etc. Average dose, Expectorant, 0.065 Gm. (1 gr.); Emetic, 1 Gm. (15 gr.). (*Fldext.; Syr.; Tr. I. et Opii; Vin.; Pulv. I. et Opii.*)

Coca. (*Erythroxylon.*)—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of the ether-soluble alkaloids of coca. Average dose, 2 Gm. (30 gr.). *Erythroxylon coca* contains *cocaine*, $C_{17}H_{21}NO_4$, and *hygrine* combined with tannic acid. (*Fldext.; Vin.*)

Cocaina, U. S.—*Cocaine.* $C_{17}H_{21}NO_4$ = 300.92.—An alkaloid [$C_8H_{13}(C_6H_5CO)NO . COOCH_3$] obtained from several varieties of Coca. Large, colorless, four-sided, monoclinic prisms, having a slightly bitter taste, and producing on the tongue a temporary numbness. Average dose, 0.030 Gm. (½ gr.). (*Oleatum.*)

Cocainæ Hydrochloridum, U. S.—*Cocaine Hydrochloride.* $C_{17}H_{21}NO_4 . HCl$; 337.10.—The neutral hydrochloride [$HCl . C_8H_{13}(C_6H_5CO)NO . COOCH_3$] of an alkaloid obtained from several varieties of coca. Colorless, transparent, monoclinic prisms, flaky, lustrous leaflets, or a white, crystalline powder, permanent in the air. Odorless, saline, slightly bitter taste, producing upon the tongue a tingling sensation, followed by numbness of several minutes' duration. Average dose, 0.030 Gm. (½ gr.).

Guarana.—Contains *caffeine*, $C_8H_{10}N_4O_2$, about 25 per cent. of tannin, resin, starch, volatile oil, saponin, etc. Average dose, 2 Gm. (30 gr.). (*Fldext.*)

Caffenia, U. S.—*Caffeine.* $C_8H_{10}N_4O_2 + H_2O$; 210.64. (*Theine.*) —A feeble basic substance [$C_5H(CH_3)_3N_4O_2$] obtained from the dried leaves of *Thea sinensis* (Fam. *Ternstrœmiaceæ*), or from the dried seeds of the *Coffea arabica* (Fam. *Rubiaceæ*); found also in other plants. White, flexible, silky, glistening needles, usually walled together in fleshy masses; permanent in the air; odorless, bitter taste. Obtained from a decoction of tea or coffee by precipitating with lead acetate, removing the lead by H_2S, adding NH_4HO, evaporating, and recrystallizing. Average dose, 0.065 Gm. (1 gr.).

Caffeina Citrata, U. S.—*Citrated Caffeine.*—A white powder; odorless; having a slightly bitter, acid taste, and an acid reaction; prepared by adding caffeine to a solution of citric acid, evaporating and reducing the product in powder. Average dose, 0.125 Gm. (2 gr.).

Caffeina Citrata Effervescens, U. S.—*Effervescent Citrated Caffeine.* —An effervescing, coarse, granular powder, prepared by intimately mixing citric acid, citrated caffeine, and tartaric acid, then thoroughly incorporating sodium bicarbonate, heating the mixture in an oven (93°–104° C.; 199°–219.2° F.), when moist rubbing through No. 6 tinned iron sieve, and drying, not above 54.4° C. (129.2° F.).

Conium. (*Hemlock.*)—Should yield, when assayed by the U. S. P. process, not less than 0.5 per cent. of conium. After being kept for more than two years, conium is unfit for use. Average dose, 0.200 Gm. (3 gr.). Conium contains *conine*, $C_8H_{17}N$; *conhydrine*, $C_8H_{17}NO$; and *methylconine*, $C_8H_{16}CH_3N$; also a little volatile oil and fixed oil. Conine is a liquid volatile alkaloid containing no oxygen, and with an odor resembling that of the urine of mice. (*Fldext.*)

Spigelia, U. S.—*Spigelia.* (*Pinkroot.*)—Contains a bitter principle, a liquid alkaloid, *spigeline*, a resin, and a trace of volatile oil, with tannin and wax. (*Fldext.*)

Scoparius. (*Broom.*)—Contains *sparteine*, a colorless liquid alkaloid, also a glucoside, *scoparin*, which probably represents the diuretic and purgative action of the drug.

Sparteinæ Sulphas, U. S.—*Sparteine Sulphate.* $C_{15}H_{26}N_2 . H_2SO_4 + 5H_2O = 419.26$.—The sulphate [$SO_2(OH)_2 . C_{15}H_{26}N_2 + 5H_2O$] of *an alkaloid* obtained from Scoparius; colorless, rhombohedral crystals, or a crystalline powder; odorless, and having a slightly saline and somewhat bitter taste. Hygroscopic. Average dose. 0.010 Gm. (1/5 gr.).

Lobelia.—Contains *lobeline*, *lobelic acid*, *lobelacrin*, wax, resin, gum, etc. *Lobeline* is a liquid alkaloid, and contains no oxygen. The average dose of lobelia is 0.5 Gm. (7½ gr.). (*Fldext.; Tr.*)

PRODUCTS FROM ANIMAL SUBSTANCES.

The animal products of pharmaceutical interest are not numerous, but some of them are very important.

Official Products Derived from the Class Mammalia.

Adeps, U. S.—*Lard.*—The prepared internal fat of the abdomen of the hog (*Sus scrofa*, var. *domesticus*), purified by washing, melting, and straining. Lard should be preserved in securely closed vessels, impervious to fat, and in a cool place. It is a soft, white, unctuous solid, having a faint odor free from rancidity, and a bland taste. Insoluble in water; very slightly soluble in alcohol; readily soluble in ether, chloroform, carbon disulphide, or petroleum benzin. Sp. gr., about 0.917 at 25° C. (77° F.), and about 0.904 at 40° C. (104° F.); water at 25° C. (77° F.) taken as the standard. It melts at 38° to 40° C. (100.4° to 104° F.) to a perfectly clear liquid, which is colorless in thin layers and from which an aqueous layer should not separate.

Adeps Benzoinatus, U. S.—*Benzoinated Lard.*—Benzoin 20 Gm., Lard 1000 Gm. When benzoated lard is to be kept or used during warm weather 5 per cent. (or more if necessary) of the lard should be replaced with white wax.

Oleum Adipus, U. S.—*Lard Oil.*—A fixed oil expressed from lard at a low temperature.

Adeps Lanæ, U. S.—*Wool-Fat.*—The purified fat of the wool of sheep (*Ovis aries*) freed from water. A light yellowish, tenacious, unctuous mass, having a slight, peculiar odor. Insoluble in, but miscible with, large quantities of water, sparingly soluble in cold alcohol, more soluble in hot alcohol, readily soluble in ether and chloroform. Melts at about 40° C. (104° F.), and at a higher temperature volatilizes, the vapor igniting and burning with a luminous, sooty flame.

Adeps Lanæ Hydrosus, U. S.—*Hydrous Wool-Fat.*—The purified fat of the wool of sheep, *Ovis aries*, mixed with not more than 30 per cent. of water. A yellowish-white, or nearly white, ointment-like mass, having a faint, peculiar odor. Insoluble in water, but miscible with twice its weight of the latter without losing its ointment-like character.

Sevum Preparatum, U. S.—*Prepared Suet.* [Sevum, Pharm. 1890.] —The internal fat of the abdomen of the sheep, *Ovis aries*, purified by melting and straining. Suet should be kept in well-closed vessels impervious to fat. It should not be used after it has become rancid. It is a white, solid fat; nearly inodorous, gradually becoming rancid on exposure to air; bland taste.

Pancreatinum, U. S.—*Pancreatin.*—A mixture of the enzymes naturally existing in the pancreas of warm-blooded animals, usually obtained from the fresh pancreas of the hog (*Sus scrofa*, var. *domesticus*), or the ox (*Bos taurus*), and consisting principally of amylopsin, myopsin, trypsin, and steapsin, and proved to be capable, when assayed by the U. S. P. process, of converting not less than twenty-five times its own weight of starch into substances soluble in water. A cream-colored amorphous powder, having a faint, peculiar, not unpleasant odor, and a somewhat meat-like taste. Prepared by slicing the fresh pancreas, kneading with water, straining, and precipitating with alcohol. Average dose, 0.500 Gm. (7½ gr.).

Gelatinum, U. S.—*Gelatin.*—The purified air-dried product of the hydrolysis of certain animal tissues, as skin, ligaments, and bones, by treatment with boiling water.

Gelatinum Glycerinatum, U. S.—*Glycerinated Gelatin.*—Gelatin 100 Gm.; Glycerin 100 Gm.; Water. Pour upon the gelatin sufficient water, previously boiled and cooled, to cover it; pour off, drain, transfer to lined dish, add glycerin, dissolve by heat, strain, continue heat until product weighs 200 Gm. When cold, cut in pieces; preserve. For making Suppositoria Glycerinæ. (See Suppositoria, Part II.)

Glandulæ Suprarenalis Siccæ, U. S.—*Desiccated Suprarenal Glands.*—The suprarenal glands of the sheep (*Ovis aries*) or ox (*Bos taurus*), freed from fat, and strained, dried and powdered. Average dose, 0.250 Gm. (4 gr.). Contains the alkaloids, *epinephrine*, $C_9H_{13}O_3N$ (Abel); *adrenaline*, $C_{10}H_{15}NO_3$ (*Takamine*); and *suprarenine*, $C_9H_{13}NO_3$ (Fürth).

Glandulæ Thyroidea Siccæ, U. S.—*Desiccated Thyroid Glands.*—The thyroid glands of the sheep, freed from fat, and cleaned, dried and powdered. Average dose, 0.250 Gm. (4 gr.). The active principle is *thyroidin*.

Pepsinum, U. S.—*Pepsin.*—A proteolytic ferment or enzyme obtained from the glandular layer of the fresh stomach of the hog (*Sus scrofa*, var. *domesticus*), and proved to be capable, when assayed by the U. S. P. process, of digesting not less than 3000 times its own weight of freshly coagulated and disintegrated egg albumin. Lustrous, white, pale yellow, or yellowish, transparent or translucent scales or grains or a fine white or cream-colored amorphous powder, free from any offensive odor, and having a slightly acid or saline taste. Prepared by Sheffer's process. The mucous membrane of hogs' stomachs is macerated with H_2O, acidulated with HCl, strained, clarified by standing, decanted, and then the pepsin precipitated with NaCl. Average dose, 0.250 Gm. (4 gr.).

Assay of Pepsin (U. S. P. process).—Pepsin 0.1 Gm.; Egg albumin 10 Gm.; Diluted Hydrochloric Acid and Distilled Water of each a sufficient quantity. Mix 9 Cc. of diluted hydrochloric acid with 291 Cc. of distilled water, and dissolve the pepsin in 150 Cc. of the acid liquid. Immerse a hen's egg, which should be fresh, during fifteen minutes in boiling water; remove the pellicle and all of the yolk; rub the white, coagulated albumin through a clean No. 40 sieve. Reject the first portion that passes through the sieve, and place 10 Gm. of the succeeding portion in a wide-mouthed bottle of 100 Cc. capacity. Add 20 Cc. of the acid liquid, and with the aid of a glass rod tipped with cork or black rubber tubing, completely disintegrate the albumin; then rinse the rod with 15 Cc. more of the acid liquid and add 5 Cc. of the solution of pepsin. Cork the bottle securely, invert it three times, and place it in a water-bath that has previously been regulated to maintain a temperature of 52° C. (125.6° F.). Keep it at this temperature for two and one-half hours, agitating every ten minutes by inverting the bottle once. Then remove it from the water-bath, add 50 Cc. of cold distilled water, transfer the mixture to a narrow graduated cylinder, and allow it to stand for half an hour. The deposit of undissolved albumin should not then measure more than 1 Cc.

The relative proteolytic power of pepsin stronger or weaker than that just described may be determined by ascertaining, through repeated trials, the quantity of the above pepsin solution required to digest, under the prescribed condition, 10 Gm. of boiled and disintegrated egg albumin. Divide 15,000 by this quantity expressed in Cc. to ascertain how many parts of egg albumin one part of the pepsin will digest.

Moschus, U. S.—*Musk.*—The dried secretion from the preputial follicles of *Moschus moschiferus* contains cholesterin, ammonia, an acid principle, wax, fat, albuminous and gelatinous principles, and an odorous matter not yet determined. Average dose, 0.250 Gm. (4 gr.).

Official Preparation.—Tinctura Moschi.

Acidum Lacticum, U. S.—*Lactic Acid.* $CH_3 . CHOHCOOH = 89.37$. A colorless, syrupy liquid, odorless, of a purely acid taste, and absorbing moisture on exposure to damp air. Sp. gr. about 1.206 at 25° C. (77° F.). Average dose, 2 Cc. (30 ♏). Composed of not less than 75 per cent., by weight, of absolute lactic acid and about 25 per cent. of water.

Lactic acid is made from sour milk, cheese, meat juice, lactin, and from many vegetable products. Cane sugar is treated with sulphuric acid, so as to convert it into invert sugar, solution of caustic soda added, and the mixture heated until it ceases to precipitate Fehling's solution; showing the absence of sugar. Sulphuric acid is added, and the sodium sulphate formed is crystallized out, an addition of alcohol causing the precipitation of the remainder. The alcoholic liquid contains impure lactic acid; one-half of it is heated and zinc carbonate added until effervescence ceases; the other half of the alcoholic liquid is now added and the whole allowed to cool. Zinc lactate crystallizes out; this, by treatment with hydrosulphuric acid, yields zinc sulphide, lactic acid remaining in solution.

Saccharum Lactis, U. S.—*Sugar of Milk.* $C_{12}H_{22}O_{11} . H_2O$; 359.16.—A peculiar, crystalline sugar obtained from the whey of cow's milk by evaporation and purified by recrystallization (see also under sugars).

Fel Bovis, U. S.—*Ox Gall.*—The fresh bile of *Bos taurus* contains *glycocholic acid*, $C_{26}H_{43}NO_6$; *taurocholic acid*, $C_{26}N_{45}NSO_7$; *hyoglycocholic acid*, $C_{27}H_{43}NO_5$; *hyotaurocholic acid*, $C_{27}H_{45}NSO_6$, and *chenotaurocholic acid*, $O_{29}H_{49}NSO_6$. A brownish-green or dark-green, somewhat viscid liquid, having a peculiar, unpleasant odor; a disagreeable, bitter taste, and a neutral or faintly alkaline reaction; sp. gr. 1.015–1.025 at 25° C. (77° F.).

Fel Bovis Purificatum, U. S.—*Purified Ox Gall.*—Fresh Ox Gall 300 Cc.; Alcohol 100 Cc. Evaporate the ox gall in a porcelain capsule, on a water-bath, to 100 Gm., then add the alcohol, mix thoroughly, and let it stand, well covered, for three or four days. Decant the clear solution, filter the remainder, and, having mixed the liquids and distilled off the alcohol, evaporate to a pilular consistence. A yellowish-green soft solid; peculiar odor; partly sweet and partly bitter taste. Average dose, 0.500 Gm. (7½ gr.).

Cetaceum, U. S.—*Spermaceti.*—A peculiar, concrete, fatty substance obtained from the head of the sperm whale, *Physeter macrocephalus.* The solid fat obtained after separating the olein by pressure, and recrystallized from alcohol, is *cetin.* On evaporation the alcohol *cetin-elain* is obtained. White, somewhat translucent, slightly unctuous masses of a scaly, crystalline fracture and a pearly lustre, with a very faint odor and a bland, mild taste. It becomes yellowish and rancid on prolonged exposure to air. Sp. gr. 0.938 to 0.944 at 25° C. (77° F.), 0.843 at 100° C. (212° F.). Melting-point 45° to 50° C. (113° to 122° F.). Spermaceti is a mixture of various fats, which, when saponified, yield *cetin-elaic acid*, an acid resembling, but distinct from, oleic acid. The cetin is essentially *cetyl palmitate*, $C_{16}H_{33}(C_{16}H_{31}O_2)$. There are small amounts of fats containing *stearic acid*, $C_{18}H_{36}O_2$; *myristic acid*, $C_{14}H_{28}O$; and *lauro-stearic acid*, $C_{12}H_{24}O_2$, and the alcohol radicals corresponding to these acids.

Official Preparation.—Ceratum Cetacei.

Serum Antidiphtheriticum, U. S.—*Antidiphtheritic Serum.*—*Diphtheria Antitoxin.*—A fluid evaporated from coagulated blood of a horse, *Equus caballus*, immunized through the inoculation of diphtheritic toxin. It should be kept in sealed glass containers, in a dark place, at temperatures between 4.5° and 15° C. (40° to 69° F.). A yellowish or yellowish-brown, transparent or slightly turbid liquid, odorless, or having a slight odor due to the presence of the antiseptic used as a preservative. Sp. gr. 1.025 to 1.040 at 25° C. (77° F.). Average dose, 3000 units. Immunizing dose for well person, 500 units.

Official Products of the Class Pisces.

Oleum Morrhuæ, U. S.—*Cod-liver Oil.* (*Oleum Jecoris Aselli.*)—A fixed oil obtained from the fresh livers of *Gadus morrhua*, and of other species of *Gadus.*

Preparation.—Heat the livers in a wooden tank by means of low-pressure steam, and drain off the oil. In the case of the finest varieties, the oil, which is made only in the winter months, is drawn off by taps from the bottom of the cooking tank, and then put into a cooling house to freeze. The solid frozen mass is put into canvas bags, and submitted, while at a low temperature, to severe pressure, whereby the pure oil is expressed. This constitutes the light oil of commerce. Cod-liver oil consists chiefly of olein, some palmitin, and stearin, with minute traces of iodine, chlorine, bromine, phosphorus, and sulphur. Oleum Morrhuæ is a colorless or pale-yellow, thin, oily liquid; sp. gr. 0.918–0.922; peculiar, slightly fishy, but not rancid odor; bland, fishy taste; faintly acid reaction.

Official Preparations.—Emulsum Olei Morrhuæ, Emulsum Olei Morrhuæ cum Hypophosphitibus.

Official Products of the Class Insecta.

Cantharis, U. S.—*Cantharides.* (*Spanish Flies.*) — The beetle, *Cantharis vesicatoria*, thoroughly dried at a temperature not exceeding 40° C. (104° F.). Cantharides owe their blistering properties to *cantharidin*, $C_{10}H_{12}O_4$, a white substance, in the form of crystalline scales, of a shining micaceous appearance; inodorous; tasteless. Average dose, 0.030 Gm. (½ gr.).

Official Preparations.—Ceratum Cantharidis, Collodium Cantharide, Tinctura Cantharidis.

Coccus, U. S.—*Cochineal.*—The dried female insect, *Pseudococcus cacti*, owes its red color to carminic acid, $C_{17}H_{18}O_{10}$. It contains mucilage, fat, inorganic salts, etc.

Cera Alba, U. S.—*White Wax.* — Yellow wax bleached. A yellowish-white solid, somewhat translucent in thin layers, having a faint, characteristic odor, and nearly tasteless. Sp. gr. 0.950 to 0.960 at 25° C. (77° F.). It is somewhat brittle when cold, and when broken presents a dull, granular, not crystalline fracture, but becomes plastic by the heat of the hand. It melts at 64°–65° C. (147.2°–149° F.).

Cera Flava, U. S.—*Yellow Wax.*—A solid substance prepared from the honeycomb of the bee, *Apis mellifica*. A yellowish to brownish-yellow solid, having an agreeable, honey-like odor and a faint, balsamic taste. Sp. gr. 0.951 to 0.960 at 25° C. (77° F.). Melting-point, 62° to 64° C. (143.6° to 147.2° F.). It is somewhat brittle when cold, and when broken presents a dull, granular, not crystalline fracture. By the heat of the hand it becomes plastic.

Beeswax is a mixture of three different substances, which may be separated from one another by alcohol, viz.: 1, *myricin*, insoluble in boiling alcohol, and consisting chiefly of myricil palmitate, $C_{30}H_{61}$-$(C_{16}H_{31}O_2)$, which is a compound of *palmitic acid*, $C_{16}H_{32}O_2$, and *myricyl alcohol*, $C_{30}H_{62}O$; 2, *cerotic acid*, $C_{27}H_{54}O_2$ (formerly called *cerin* when obtained only in an impure state), which is dissolved by boiling alcohol, but crystallizes out on cooling; 3, *cerolein*, which remains dissolved in the cold alcoholic liquid. This latter is probably a mixture of fatty acids, as indicated by its acid reaction to litmus paper. — (Remington.)

UNITED STATES COAST AND GEODETIC SURVEY.

By permission of T. C. MEN

TABLES FOR CONVERTING U. S. WEIGHTS

LINEAR.

	Inches to millimetres.	*Feet to metres.*	*Yards to metres.*	*Miles to kilometres.*
1 =	25.4000	0.304801	0.914402	1.60935
2 =	50.8001	0.609601	1.828804	3.21869
3 =	76.2001	0.914402	2.743205	4.82804
4 =	101.6002	1.219202	3.657607	6.43739
5 =	127.0002	1.524003	4.572009	8.04674
6 =	152.4003	1.828804	5.486411	9.65608
7 =	177.8003	2.133604	6.400813	11.26543
8 =	203.2004	2.438405	7.315215	12.87478
9 =	228.6004	2.743205	8.229616	14.48412

SQUARE.

	Square inches to square centimetres.	*Square feet to square decimetres.*	*Square yards to square metres.*	*Acres to hectares.*
1 =	6.452	9.290	0.836	0.4047
2 =	12.903	18.581	1.672	0.8094
3 =	19.355	27.871	2.508	1.2141
4 =	25.807	37.161	3.344	1.6187
5 =	32.258	46.452	4.181	2.0234
6 =	38.710	55.742	5.017	2.4281
7 =	45.161	65.032	5.853	2.8328
8 =	51.613	74.323	6.689	3.2375
9 =	58.065	83.613	7.525	3.6422

CUBIC.

	Cubic inches to cubic centimetres.	*Cubic feet to cubic metres.*	*Cubic yards to cubic metres.*	*Bushels to hectolitres.*
1 =	16.387	0.02832	0.765	0.35242
2 =	32.774	0.05663	1.529	0.70485
3 =	49.161	0.08495	2.294	1.05727
4 =	65.549	0.11327	3.058	1.40969
5 =	81.936	0.14158	3.823	1.76211
6 =	98.323	0.16990	4.587	2.11454
7 =	114.710	0.19822	5.352	2.46696
8 =	131.097	0.22654	6.116	2.81938
9 =	147.484	0.25485	6.881	3.17181

The only authorized material standard of customary length is the Troughton standard. The yard in use in the United States is therefore equal to the British

The only authorized material standard of customary weight is the Troy pound standard of mass. It was derived from the British standard Troy pound of 1758 latter, and contains 7000 grains Troy.

The grain Troy is therefore the same as the grain Avoirdupois, and the pound

The British gallon = 4.54346 litres.

The British bushel = 36.3477 litres.

OFFICE OF STANDARD WEIGHTS AND MEASURES.

DENHALL, Superintendent.

AND MEASURES—CUSTOMARY TO METRIC.

CAPACITY.

	Fluidrachms to millilitres to cubic centimetres.	*Fluidounces to millilitres.*	*Quarts to litres.*	*Gallons to litres.*
1 =	3.70	29.57	0.94636	3.78544
2 =	7.39	59.15	1.89272	7.57088
3 =	11.09	88.72	2.83908	11.35632
4 =	14.79	118.30	3.78544	15.14176
5 =	18.48	147.87	4.73180	18.92720
6 =	22.18	177.44	5.67816	22.71264
7 =	25.88	207.02	6.62452	26.49808
8 =	29.57	236.59	7.57088	30.28352
9 =	33.28	266.16	8.51724	34.06896

WEIGHT.

	Grains to milligrammes.	*Avoirdupois ounces to grammes.*	*Avoirdupois pounds to kilogrammes.*	*Troy ounces to grammes.*
1 =	64.7989	28.3495	0.45359	31.10348
2 =	129.5978	56.6991	0.90719	62.20696
3 =	194.3968	85.0486	1.36078	93.31044
4 =	259.1957	113.3981	1.81437	124.41392
5 =	323.9946	141.7476	2.26796	155.51740
6 =	388.7935	170.0972	2.72156	186.62089
7 =	453.5924	198.4467	3.17515	217.72437
8 =	518.3914	226.7962	3.62874	248.82785
9 =	583.1903	255.1457	4.08223	279.93133

1 chain = 20.1169 metres.
1 square mile = 259. hectares.
1 fathom = 1.829 metres.
1 nautical mile = 1853.27 metres.
1 foot = 0.304801 metre, 9.4840158 log.
1 avoir. pound = 453.5924277 grammes.
15432.35639 grains = 1 kilogram.

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scale belonging to this office, whose length at 59.62° Fahr. conforms to the British
yard.
of the Mint. It is of brass of unknown density, and therefore not suitable for a
by direct comparison. The British Avoirdupois pound was also derived from the

Avoirdupois in use in the United States is equal to the British pound Avoirdupois.

UNITED STATES COAST AND GEODETIC SURVEY.

By Permission of T. C. MEN

TABLE FOR CONVERTING U. S. WEIGHTS

LINEAR.

	Metres to inches.	*Metres to feet.*	*Metres to yards.*	*Kilometres. to miles.*
1 =	39.3700	3.28083	1.093611	0.62137
2 =	78.7400	6.56167	2.187222	1.24274
3 =	118.1100	9.84250	3.280833	1.86411
4 =	157.4800	13.12333	4.374444	2.48548
5 =	196.8500	16.40417	5.468056	3.10685
6 =	236.2200	19.68500	6.561667	3.72822
7 =	275.5900	22.96583	7.655278	4.34959
8 =	314.9600	26.24667	8.748889	4.97096
9 =	354.3300	29.52750	9.842500	5.59233

SQUARE.

	Square centimetres to square inches.	*Square metres to square feet.*	*Square metres to square yards.*	*Hectares to acres.*
1 =	0.1550	10.764	1.196	2.471
2 =	0.3100	21.528	2.392	4.942
3 =	0.4650	32.292	3.588	7.413
4 =	0.6200	43.055	4.784	9.884
5 =	0.7750	53.819	5.980	12.355
6 =	0.9300	64.583	7.176	14.826
7 =	1.0850	75.347	8.372	17.297
8 =	1.2400	86.111	9.568	19.768
9 =	1.3950	96.874	10.764	22.239

CUBIC.

	Cubic centimetres to cubic inches.	*Cubic decimetres to cubic inches.*	*Cubic metres to cubic feet.*	*Cubic metres to cubic yards.*
1 =	0.0610	61.023	35.314	1.308
2 =	0.1220	122.047	70.629	2.616
3 =	0.1831	183.070	105.943	3.924
4 =	0.2441	244.093	141.258	5.232
5 =	0.3051	305.117	176.572	6.540
6 =	0.3661	366.140	211.887	7.848
7 =	0.4272	427.163	247.201	9.156
8 =	0.4882	488.187	282.516	10.464
9 =	0.5492	549.210	317.830	11.771

By the concurrent action of the principal governments of the world an Inter
the direction of the International Committee, two ingots were cast of pure plati
From one of these a certain number of kilogrammes were prepared, from the other
tercompared, without preference, and certain ones were selected as International
ments, and are called National prototype standards. Those apportioned to the

The metric system was legalized in the United States in 1866.

The International Standard Metre is derived from the Metre des Archives,
platinum-iridium bar deposited at the International Bureau of Weights and Meas

The International Standard Kilogramme is a mass of platinum-iridium de
gramme des Archives.

The liter is equal to a cubic decimetre of water, and it is measured by the quan
ard kilogramme in a vacuum, the volume of such a quantity of water being, as

OFFICE OF STANDARD WEIGHTS AND MEASURES.

DENHALL, Superintendent.

AND MEASURES—METRIC TO CUSTOMARY.

CAPACITY.

	Millimetres or cubic centimetres to fluidrachms.	*Centilitres to fluidounces.*	*Litres to quarts.*	*Decalitres to gallons.*	*Hectolitres to bushels.*
1 =	0.27	0.338	1.0567	2.6417	2.8375
2 =	0.54	0.676	2.1134	5.2834	5.6750
3 =	0.81	1.014	3.1700	7.9251	8.5125
4 =	1.08	1.352	4.2267	10.5668	11.3500
5 =	1.35	1.691	5.2834	13.2085	14.1875
6 =	1.62	2.029	6.3401	15.8502	17.0250
7 =	1.89	2.368	7.3968	18.4919	19.8625
8 =	2.16	2.706	8.4534	21.1336	22.7000
9 =	2.43	3.043	9.5101	23.7753	25.5375

WEIGHT.

	Milligrammes to grains.	*Kilogrammes to grains.*	*Hectogrammes (100 grammes) to ounces Av.*	*Kilogrammes to pounds Avoirdupois.*
1 =	0.01543	15432.36	3.5274	2.20462
2 =	0.03086	30864.71	7.0548	4.40924
3 =	0.04630	46297.07	10.5822	6.61386
4 =	0.06173	61729.43	14.1096	8.81849
5 =	0.07716	77161.78	17.6370	11.02311
6 =	0.09259	92594.14	21.1644	13.22773
7 =	0.10803	108026.49	24.6918	15.43235
8 =	0.12346	123458.85	28.2192	17.63697
9 =	0.13889	138891.21	31.7466	19.84159

WEIGHT—(CONTINUED).

	Quintals to pounds Av.	*Milliers or tonnes to pounds Av.*	*Grammes to ounces, Troy.*
1 =	220.46	2204.6	0.03215
2 =	440.92	4409.2	0.06430
3 =	661.38	6613.8	0.09645
4 =	881.84	8818.4	0.12860
5 =	1102.30	11023.0	0.16075
6 =	1322.76	13227.6	0.19290
7 =	1543.22	15432.2	0.22505
8 =	1763.68	17636.8	0.25721
9 =	1984.14	19841.4	0.28936

national Bureau of Weights and Measures has been established near Paris. Under
num-iridium in the proportion of nine parts of the former to one of the latter metal,
a definite number of metre bars. These standards of weight and length were in-
prototype standards. The others were distributed by lot to the different govern-
United States are in the keeping of this office.

and its length is defined by the distance between two lines at 0° Centigrade, on a
ures.
posited at the same place, and its weight in vacuo is the same as that of the Kilo-

tity of distilled water which, at its maximum density, will counterpoise the stand-
nearly as has been ascertained, equal to a cubic decimetre.

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